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MILITARY OPERATIONS IN THE UNITED KINGDOM CONSIDERED, PARTICULARLY AS INFLUENCED BY THE ENCLOSED NATURE OF THE COUNTRY.

By CAPTAIN J. K. TROTTER, R.A. (R.A. Institution Prize Essayist, 1878).

"Far other is this battle in the West,
"Whereto we move, than when we strove in youth."
Tennyson.

IF it were given us for a few brief moments to pass behind the veil which hides from our eye the unseen world of the future, and to learn what events are in store for this country, there is no point of public interest upon which the patriotic Englishman, none certainly upon which the English soldier, would so eagerly seek for information, as to learn when, under what circumstances, and with what result will this country next become the scene of military operations. So many generations have been born and have passed away since last the population of the United Kingdom had an actual and practical acquaintance with the miseries of war, that we have learned to class war in Great Britain with those extirpated wild beasts which formerly inhabited the land, as a state of things interesting to us only as a matter of history.

To the mind of the ordinary Englishman of the present day, war is a calamity, deplorable indeed, but at the same time remote, and, as applied to our own land, unreal. From time to time the death struggles of nations at no great distance from our shores, the slaughter of a number of our countrymen in one of our numerous colonial wars, or perhaps the publication of some pamphlet, which calls attention to the state of our defences, and sends us into a brief nightmare, takes away something from the feeling of the remoteness of war; but the sense of its unreality we never entirely lose. It is doubtless owing to this confidence in the security of our position outside of the great gladia-

torial arena of Europe, that our race is, according to the standard of continental Europe, so distinctly unmilitary. Even the question of an invasion, when it occasionally crops up, is almost invariably treated by us in the spirit of Canute's command to the ocean: "Thus far shalt "thou come, and no farther." In one of Mrs. Beecher Stowe's best known works, an incident occurs which may be quoted as illustrating this point. A Quaker, who had extended his protection to some runaway slaves, is represented as receiving at the top of a chasm the onslaught of a slaveowner in pursuit of some runaways, and hurling him to the bottom with the remark, "Friend, thee isn't wanted here." This remark expresses, ungrammatically it may be, but not inaptly, the spirit of the general public with regard to the question of invasion. We believe as well in the ability of the country to act the part of the Quaker towards an invader, as in its readiness to repeat his sentiment. Desirable, and it is to be hoped, practicable as such a part may ever be, it cannot be otherwise than prudent to remember that a large and important branch of our national forces is enrolled, organized, and trained, solely with a view to act in case circumstances should at any moment take from us the power of playing it; and that by limiting all our thoughts upon the subject of invasion to our action outside of, and on the very borders of the country, we lose the many valuable lessons which might otherwise bear fruit in promoting the efficiency of these forces. Therefore, it cannot be but profitable to look occasionally a little nearer home, and if, for argument's sake alone, to admit the possibility of having to meet the invader upon our sacred territory. Accordingly, it is proposed to assume here that the Quaker has not been able to carry out his good intentions as expressed above; that he and his opponent are met upon the territory of the former, and to review their probable course of action with a view to deducing its effect upon the military art in general, and upon the training of our own forces in particular.

To the better understanding of the questions relating to military operations in the United Kingdom, and in order to get as near as possible to the root of the subject, it will be divided in the first instance, as follows:—

1st, the military features of the United Kingdom will be examined, and then, 2ndly, an attempt will be made to trace their general effect upon strategy and tactics. In doing this, it must be our object to endeavour as far as possible to avoid entering upon a mere repetition of the well-known principles of strategy, and of going over again the well-nigh worn out ground of the attack and defence. It will be more profitable in the present instance to seek for what is peculiar and exceptional in the features of England, and for the peculiar and exceptional influence which these features will exercise upon the strategy and tactics of armies operating within the United Kingdom.

It will be convenient to take England as representing the United Kingdom, and to confine our researches to that country, because England, as containing the heart of the Empire, is the part of the United Kingdom most likely to be selected for military operations; and also because the deductions which a study of the features of

England as a theatre of war will lead to, are in the main applicable to the greater part of the United Kingdom.[1] The topography of the north of Scotland is so distinct from that of the remainder of the kingdom, and its influence upon military operations would probably be so entirely different, that the study of this would have to be made a separate subject. Considering the great improbability of that country ever becoming a theatre of military operations, it will hardly repay us to enter into the consideration of that branch of the question in this essay.

1. *The Military Features of England.*

The point which first calls for our attention is the size of England, as a theatre of war, and the nature of its boundaries. The extreme length and breadth of the country may be roughly estimated as within 300 and 400 miles respectively. The distance of the capital from the coast varies from about 35 miles as a minimum, to some 300 miles as a maximum, and thus any point on the English coast lies at a distance from the capital of not less than 35 miles, and not more than 300. It is also important to observe, that the centre of England is within 100 miles of the coast both on the east and west, and that at no point of the interior is the coast at a greater distance than 100 miles, and at most points the coast in two opposite directions is within this distance. The country is surrounded on all sides, except on the north, by the sea, which may be regarded as a strategical obstacle passable only at certain points, and under conditions which will be subsequently alluded to.

Means of Communication.

These may be divided into *rail communications*, *road communications*, and *water communications*.

Rail communications.—The railway systems of England are most complete, and in importance and extent far excel those of all continental Powers. Every point in the country is within a very short distance of one or more lines of rail. These lines, one and all, with the exception of some small branch lines, converge upon the capital, which is thus the focus of, and the key to, all the great railway systems of the kingdom, and is in direct railway communication with every district and every town of importance. It must be noted, however, that although London is the key to all the great railway systems, yet these systems are also connected with each other at numerous different points outside of and at varying distances from London.

In addition to the capital there are many other minor capitals which form foci of railway systems, and from which lines of rail radiate in all directions. Among these the most important are Bristol and Portsmouth, in the south; in the central counties, Shrewsbury, Birmingham, and Leicester; in the north, Liverpool, York, Leeds, and Newcastle.

None of these lines of rail have been laid down for strategical

[1] It will be convenient to include Wales under the general denomination of England.

purposes, and yet their conformation would no doubt create strategical points in a campaign. Thus in the case of an army acting against London, such places as Reading, Guildford, Reigate, Basingstoke, Hitchin, Clapham, &c., would become important strategical points in connection with the railroad communications.

The railroad gauge throughout the country is the same, the one line which is laid for the broad gauge (the Great Western) being also laid with the ordinary gauge. Thus the rolling stock (except that of broad gauge construction, of which probably there is very little in use) can be used indifferently on all the lines.

Road communications.—The lines of road, though sufficiently numerous and well kept, are relatively inferior in all respects to the lines of rail; indeed, it is probable that the almost universal adoption of the railroad as a means of communication has led to a certain neglect of road communication. On account of the value of land in the United Kingdom, space has been economized as much as possible in their construction, and, as a result, their breadth is inconsiderable as compared with the great roads of the Continent. On either side they are closely enclosed by fences, and thus it is possible to march troops only on the road itself, and there on a narrow front.

Water communication.—The means of water communication in the interior by canals and rivers are only important in certain localities, and even here these communications would only influence military operations when the lines of rail were broken up or disused.

There is, however, another means of water communication which should not be lost sight of, as, under certain possible circumstances, it might come to play a very important part in a campaign. This is by means of vessels plying along the coast and up tidal rivers. The number of craft available for such purposes, which could be got together in an emergency, is so enormous that there is practically no limit to the amount of work which could be done in conveying troops, stores, &c., by this means between points suitable for such purposes.

Telegraph communication.—The lines of telegraph are very numerous and complete. They follow all the lines of rail and the main roads, and connect every small town and respectably sized village with the local capitals. These capitals are in turn connected with London, which is thus the key to the whole system. At the same time the lines of telegraph have numerous means of intercommunication in addition to that through London.

Fortifications.

A distinctive feature of the country is the complete absence of any fortifications in the interior. The permanent fortifications which exist are all on the coast, and their object begins and ends with the preventing an enemy from gaining a foothold in the country. Thus the capital and all the great centres of industry and wealth in the country are entirely unprotected and open. Most of these towns cover such an enormous extent of ground, and end so gradually, that a system of works to cover them must needs be very extensive and would require large garrisons. Moreover, in order to put any system of works in a

state to stand a siege, on account of the numerous straggling houses on the outskirts of all towns, and the enclosed nature of the country, a very great destruction of private property and also a great expenditure of time and labour would be necessary.

Population and Food Supply.

In all parts of England the population is very dense, and the number of centres of industry and manufactures very great. The number of towns of various sizes and of large villages is so great and so evenly distributed, that an army marching with an ordinary front would, in almost every part of the country, be certain of finding ready to hand a good and sufficient supply of provisions and forage. It must be borne in mind, however, that a very large proportion of the food supply is derived from foreign sources. A war, therefore, which threw out of gear these means of supply, and which lasted long enough to drain the supplies accumulated in all large towns, would lessen very greatly the food supply. It is probable, however, that this would not affect in a very appreciable degree the question of the supply of two armies operating within the United Kingdom, except after a long campaign, as the size of the armies would bear but a small proportion to the population amongst which they were distributed, but it would doubtless cause serious distress to the latter.

Strategical Obstacles.

Another peculiar feature of the country is the almost complete absence in the interior of any of those great natural strategical obstacles which have always exercised so great an influence in almost all the campaigns of continental Europe. The few mountains which are to be found, and which in height are not very important, lie all so near to the coast and are so remote from the part of the country likely to be selected for military operations, that their influence in a campaign upon strategy would hardly ever be felt. A glance at the maps will convince us that the mountains of Wales, Cumberland, Northumberland, and Cornwall and Devon lie outside of the theatre of important operations. The hills of the south of England afford defensible positions, but they have no right to be classed as strategical obstacles.

The rivers, too, are small and narrow, crossed by many bridges, fordable at numerous points, and form very insignificant obstacles to the advance of an army except near their mouths. As a rule they are tidal only for short distances from their mouths. The few which would present anything of an obstacle are the Thames below London, the Ouse below Selby, the Tees below Stockton, the Tyne below Newcastle, the Mersey below Runcorn, the Dee below Chester, the Severn below Gloucester, and perhaps one or two others. These river mouths, however, from their position along the coast, are generally outside of the main theatre of operations.

The only other strategical obstacles in the country which merit attention are the marshes of Cambridgeshire, and Suffolk, and Essex. From their position at no great distance from the capital, these may

be regarded as of some importance in connection with operations to the north-east of London, but the numerous roads and lines of rail which run through these counties take away much from their importance as strategical obstacles.

The Enclosed Nature of the Country.

This is the peculiar feature of English country, and one which evidently must exercise an exceptional influence upon military operations. It will be necessary to study it a little in detail in order to form a just estimate of this influence. The enclosures may be divided broadly into two main classes, the first comprising walled enclosures, and the second the enclosures occupied by land under cultivation, plantations, &c. The walled enclosures, which consist of towns, villages, country houses, churches, institutions, farms, and other houses, with their gardens and grounds, are in no essential point different from those of other countries, except, perhaps, that they are more numerous. The fenced enclosures which cover by far the greater part of Great Britain, are peculiar to the country. These enclosures vary in size in different parts of the country, and they are divided by fences of different description, by dykes and by ditches. The hedge, which is by far the most common nature of fencing, consists, as a rule, to which there are exceptions, of a bank raised by excavating a ditch on one or both sides of the boundary of the enclosure, and a strong thorn planted along the top. This description of hedge affords complete concealment to troops lying down behind it, and is frequently high and thick enough to conceal mounted troops. It also generally gives very complete cover to infantry in single rank, and sometimes in double rank, from infantry fire, and to a great extent also from artillery fire, on one or both sides, sometimes on one side partially, and on the other completely. Thus the hedge with ditch form a very strong natural shelter trench, at any rate on one side, capable, owing to the softness of the soil, of being quickly improved or modified in any way, but with this great disadvantage, that it does not admit of the advance of the troops occupying it except on a very narrow front, or after considerable labour and exposure in levelling the hedge.

Other descriptions of fencing there are, such as quickset hedges planted on level ground, which give concealment but no cover to infantry lying down, and which are as difficult as the former to pass; hurdles, wire railing, &c., which give neither concealment nor cover, and form an obstacle easily passed by infantry, but difficult for other troops; walls which give cover and concealment, and are difficult to pass; ditches and banks which are sometimes easy, sometimes difficult, to pass, and which generally afford complete cover to infantry, sometimes also to mounted troops.

Such are the different natures of fencing which enclose cultivated land. It must be noticed, however, that infantry may be certain of finding cover almost always at the boundary of each enclosure, for the drainage of cultivated land renders it necessary to excavate a ditch for each field.

The land enclosed by these fences is almost entirely under cultivation,

and upon it are grown crops of various kinds, the most common being corn crops, grass (for pasturage or meadow), turnips, potatoes, peas, beans; hops, in Kent, Surrey, Hampshire. The effect of these crops on military operations will differ, as it will subsequently appear, at different seasons of the year.

The enclosures differ considerably in character in different parts of the country. In the great central plain of England, which extends north, east, and west of London, the country is level, highly cultivated, and closely enclosed, except in the greater part of the county of Hertfordshire; the soil is heavy, and very difficult for mounted troops or wheeled carriage, and the fences are high and strong. The range of vision is greatly limited by the enclosures, except from the few eminences which are to be met with, and even from them the abundance of trees on the generally flat terrain forms a screen which is almost everywhere impenetrable. As we travel northwards the nature of the country changes. In South Yorkshire, Lancashire, and Derbyshire, the country is more varied, more broken, more hilly, less enclosed, and some few open spaces are to be found. The centre and north of Yorkshire are again level, the east hilly and little enclosed; Durham, as a rule, and parts of Northumberland are closely enclosed, but a great part of the latter county and almost all Cumberland and Westmoreland are hilly, barren, varied, and little enclosed. The lakes of the two latter counties form an important feature. Wales, especially in the north and east, is hilly, barren, and little enclosed. The counties of Cornwall and Devon are hilly, broken, and generally open; Somerset still comparatively little enclosed, but more level and more cultivated than Cornwall and Devon. The counties of Surrey, Sussex, Hampshire, Wiltshire, Kent, Dorset and Hertfordshire, form a special feature in the physical geography of England. The country throughout the greater part of these counties is generally undulating, large open spaces are frequent, vegetation is scarce; a great extent of country which is broken up into downs is used for grazing purposes, and is covered with short herbage. The view is extensive from the summit of the undulating heights, the fences are small and comparatively easy to pass, the land is light, free from moisture, and firm, and there is little to prevent the advance of large bodies of troops on an extended front.

At the different seasons of the year the country presents many different features which must not be lost sight of. In the spring and summer the abundant foliage greatly adds to the difficulty of obtaining an uninterrupted view, the hedges become more complete screens, and are much stronger and more difficult to pass. The crops of standing corn, the meadow land, the hop gardens, &c., afford abundant means of concealment to infantry, but render their progression slow and laborious, and impede greatly the movements of mounted troops, especially of artillery, for which the cultivated land is only passable for short distances. In the winter, on the other hand, the foliage is dead, the view less interrupted, the hedges are thinner and weaker, there is little or no means of concealment for infantry in the bare fields; the ploughed land is heavy and fatiguing for heavily equipped infantry

and cavalry, and impassable for artillery except for short distances. The stubble land, on the contrary, is comparatively easy for cavalry and infantry, and may be used by artillery to a limited extent. The land is generally heavy and full of moisture at this time of year.

The surface of the land under cultivation is so soft, and the soil so easy to be worked, that the country is peculiarly suited for the work of throwing up hasty defences, and excavating shelter trenches. The land, when not covered by high standing crops, affords very little cover or concealment, except at the fences, the surface of the cultivated ground being generally smooth and unbroken, the slopes gradual, and irregularities cleared away.

2. *Their Influence upon Tactics.*

Inverting the usual order of things, the influence of the features just described upon tactics will now be considered, because, as it will be seen afterwards, their influence upon strategy will be affected through the tactical bearing of the question. We shall probably not have much difficulty in arriving at the conclusion that only the last mentioned of the features of the military geography of England, viz., the enclosed nature of the country, will have any marked exceptional influence upon the tactics of armies operating in the United Kingdom. This feature, however, we may naturally expect to modify in a considerable degree the generally accepted principles of the attack and defence. As we have no experience of modern campaigns conducted under conditions precisely similar to those of the case now under consideration, as circumstances vary so much in different localities and at different times of the year, and as so many opposing principles are involved in the different aspects of the question, it will be necessary to proceed with much caution, and not to place a blind and universal reliance upon conclusions, which apply to certain particular localities, and under certain particular circumstances.

It has been remarked that we have no experience of modern campaigns fought under conditions precisely similar to those of our present subject. It may be noticed, however, that some of the campaigns of the American War, notably that of Sherman, in Georgia, were fought on ground which presents features in many respects similar to those of an English country, similar, at any rate, in their effect upon the military operations, and from them some useful lessons may be drawn. At the same time, it must be borne in mind that these campaigns were fought under peculiar conditions, and, therefore, we must be careful to avoid accepting unreservedly the many deductions drawn by Americans themselves from them, as applicable to fighting in England.

Tactical action in an enclosed country may be considered under three heads: (*a*) The general characteristics of the attack and defence of a cleared position, or of an open position, in the midst of enclosed country; (*b*) of a prepared but not cleared position; (*c*) of a position which has not been prepared.

(*a.*) *General characteristics of the Attack and Defence of an Open or Cleared Position in enclosed Country.*—As the assailant's advanced

guards on each line of road approach the defender's position they will be met by the defender's outposts and advanced parties, and easily held in check. It will be necessary constantly to deploy in the enclosures, to send guns to prominent points in order to drive the enemy back, and then perhaps to return and re-form column on the roads. This deploying and re-forming column implies necessarily a great expenditure of time which might be of great value to the defender, for it is evident that the labour of deploying, at all times a tedious business, will be more than doubled in an enclosed country where hedges have to be levelled, and where the ground is soft and heavy. The defender, by these means, and by resisting the advance at the most closely enclosed and the most disadvantageous points for deployment, may gain a great deal of time, and may quite conceivably bring the advance to a standstill till the positions are turned. At length the defender will be driven back, step by step, till the assailant arrives within sight of the open space. Here the resistance will increase, and the defender will push forward a large force of guns and of light troops to force the assailant to deploy early, to prevent his columns advancing along the roads, and to cause him loss and annoyance during his deployment. The assailant's advanced guards will seek to take up strong commanding points to cover the deployment, and the artillery available on each line of road will be pushed to the front to drive back the defender, and to search out the position. The deployment of these guns in enclosed country will naturally be difficult and slow, the action of the whole force disjointed, batteries being separated by the hedges, and their view being from the same cause interfered with. The communication of orders to them will be a matter of much difficulty, and therefore their action will be hard to direct to the attainment of any special purpose.

Meanwhile the deployment will be going on and will be a matter involving delays and much labour. The assailant, too, will be reconnoitring the defender's position, and considering how and where the chief attacks are to be directed. The position may be supposed to be an ordinary one, such as would be prepared in an open country, having, perhaps, some strong salients pushed forward almost to the limits of the open ground, and also, besides a main line of intrenchments, a second line to allow the defender, if driven from the main position, to resist the assailant till his main body is safely on the roads.

Once the assailant's force is deployed, there will be little peculiar about the action. The artillery may have to commence their action in the enclosed country, and may, from the reasons stated before, find a difficulty in concentrating their fire upon the decisive points. Their further advance will be difficult, irregular, and slow, and the defender will have an opportunity of crushing the batteries in detail as they come up. Thus in the great artillery duel the defender will derive some advantages proportional to the nature of the enclosures and the difficulty of the ground for moving guns on. In the further conduct of the action there will be nothing special. The defender, if forced from his main position, will retire upon his second line of intrenchments, and, leaving a rear-guard to occupy these, will with-

draw his forces on to the roads, retiring the infantry and cavalry, perhaps, through the enclosures for some distance, openings having been previously prepared for their passage. The artillery and trains will keep the roads. In such a case the assailant will be able to effect little beyond the capture of the position, and the defender will withdraw without much risk of being closely pursued. Should, however, the defender be attacked in flank, and driven at the same time from both positions, or should his troops be much demoralized, an assailant who has fresh troops, especially cavalry and guns, ready to follow up his success immediately, may drive the defender back upon the enclosures and disperse them before they have been rallied, and take from them all power of further resistance. In such a case the enclosures would prove disadvantageous to the beaten force, as it would increase their confusion, and interfere with their free retreat, and make them an easy prey to troops who had the presence of mind to take advantage of their confusion. Similarly, if the attack is repulsed, the defender's chance of inflicting a blow upon his opponent will depend upon the moral condition of the latter, and the measures he has taken to secure his retreat. Small bodies of troops who know the country would have a great advantage in following up a beaten enemy, as they would have little fear of molestation, and would be able to take the greatest advantage of their superior knowledge.

Thus, to summarize the results of our inquiry, in the attack of an open position in enclosed country, the defender would be able to check the advance of his assailant before his arrival at the open country, to force him to deploy in the enclosed country and to move over the cultivated ground. The defender would generally take means to secure his retreat; but if much demoralized, or if driven back in an unforeseen direction, he might suffer much from the nature of the country; otherwise his retreat would be little molested. The assailant might similarly suffer if demoralized, or if he had made no preparations to secure his retreat.

But it may happen that the army acting on the defensive has not had time to clear the country of the fences, &c., or that it seeks only to check the advance of the opposing army, which brings us to the second part of our inquiry.

(*b.*) *The characteristics of the Attack and Defence of a Prepared, but not Cleared, Position in enclosed Country.*—It will be necessary to glance briefly at the measures, which, under the circumstances mentioned above, would probably be taken to prepare a position for defence. The principal requisites for a defensive position are in a few words:—(1) A clear field of fire; (2) security for the flanks; (3) free communication between the parts of the army and with the rear; (4) a secure means of retreat; (5) cover for the fighting line, concealment for the second line and reserves. To fulfil all these conditions a great expenditure of time and labour will be necessary. The defender will probably seek, above all things, to occupy a commanding position, so that the assailant may be seen at every step of his approach, that the defender may be able to concentrate his artillery

fire, and that the reverse slope of the commanding position may conceal his second line and reserves. All those fences which would interfere with the direct fire from the position and would give cover to the assailant must be cut down and their ditches filled up. Those fences, too, which might prevent the defender concentrating his artillery fire should be cut down till the defender is able to see over them; but all fences which break up the assailant's formation without giving him cover, should be left standing. The flanks should rest upon strong natural points, or should be strongly supported by intrenchments, and it would probably be advisable to clear away all fences within range of an assailable flank, but certainly those which would give cover to a flank attack. A line of hedgerows along the front of a position would be easily adapted as a shooting trench for the fighting line, care being taken to level the hedges so as to admit of the defenders assuming the offensive; but parts naturally strong might have the fences left standing, or might even be strengthened and occupied by comparatively small bodies or by troops incapable of offensive action, in order that points naturally weaker or more suitable for offensive action might be reinforced. A line of hedgerows in front of this main line might be adapted as an advanced shooting trench, care being taken to expose the exterior of it to the main position. If possible, a second, and even a third line might, under the same conditions, be adapted as shooting trenches, as long as their position and profile rendered them useless to the assailant if occupied by him. A second line of intrenchments behind the main position would be almost indispensable, in order that the defender, if forced from his main position, might occupy them and withdraw his forces without exposing them to the artillery fire of the assailant, and in order to allow them to get well away before they are pursued. The defender must needs take all possible measures to perfect the communication between his position and the rear. The fences, if not levelled, must have frequent openings made in them, and the roads connected with the parts of the position nearest to them. The line of retreat of each section of the defence must be very clearly explained to the subordinate commanders beforehand. The intercommunication between the parts of the defender's army must be secured by roads running along the position, and by levelling the fences which obstruct it, or at least by making many openings in them. Some strong salients, especially if their commanding position permitted an extensive view, might be occupied in force, and might conceal troops destined for offensive purposes. It might probably be necessary to clear away from their neighbourhood the fences within range which might obstruct their fire and might interfere with the offensive action of the troops which they covered. Those fences running into the assailant's position at right angles to his front which it might be necessary to cut down to a lower level, in order to admit of the concentration of the defender's guns, might be made stronger by intertwining boughs, cut half through, with the part of the hedge left standing, in order that they might retain their character as obstacles, and might be difficult for the assailant to pass.

Such are some of the most obvious measures which a defender may

be expected to take to strengthen a position, and to increase his powers of keeping his opponent at bay. The attack of such a position will, in the first instance, resemble that of the case last considered, as in that case, the advance will be slow, as the assailant comes into contact with the defender's troops. The enclosures on the flanks of each line of advance will have to be carefully searched out. The defender's advanced troops and artillery will probably engage the advanced guard, and force them to bring up guns to drive them back. This will be a matter of difficulty, and will waste time. The advanced guards will then seek to take up commanding positions to cover the deployment, and the position will be reconnoitred. The task of reconnoitring the position will be a difficult and dangerous one. The force of the assailant will be compelled to commence its deployment at a considerable distance from the position, and will have to advance for some distance over the closely enclosed cultivated land, and will be resisted by the defender's outposts, and probably seriously annoyed. The defender, knowing well the ground, will have the advantage in these preliminary actions, and may succeed in leading the assailant's troops into a trap, and in capturing some of his isolated detachments. Having eventually driven back these advanced troops, the assailant will move forward his guns, and endeavour to draw the fire of the artillery from the main position, and to discover the extent of the position and its salients. Meanwhile, the infantry will have been deployed, and bodies of cavalry sent round the flank, to disquiet the enemy and to reconnoitre his position. The points of attack having been determined upon, the artillery will advance to a decisive position. This advance will necessarily be attended by many difficulties. The force will be broken up into sections by the hedges; its movements will be irregular, its advance slow and broken on account of the difficulty of moving over cultivated ground. The fences, which impede its advance, if cut down, will be none the less obstacles in most cases to its advance, and it will be necessary to make openings in them. Thus the defender will have an opportunity of crushing the batteries as they advance one by one, of concentrating fire upon them as they move through narrow openings, and at a slow pace. When eventually they are in position, their action will not be concerted owing to the difficulty of communicating orders, and their effect will, therefore, be proportionately decreased. But this will not be the greatest disadvantage they will labour under. Unless their position is a commanding one, the fences will prevent them from concentrating their fire upon the decisive points, and their position will be much more apparent to the defender than his to them. For these reasons they will have much difficulty in overcoming the defender's artillery fire and in breeching his position. The trenches of the defender's infantry will give them much security against this artillery fire, and the infantry attack may therefore have to be made upon unshaken troops.

The infantry, when deployed for attack, will similarly be broken up into sections varying in strength with the size of the enclosures. Their action must depend entirely upon the commander of each section. They will be, to a great extent, beyond the reach of orders,

and they certainly cannot be handled by any one not in the same enclosure with them. They will not be able to move to the right or left except at some few points, and then probably with difficulty, so it will rarely be possible to reinforce any point except from the rear, to change the direction of an attack, or to sweep round the flanks of an obstacle. They will, however, gain some few advantages. The direction of their attack will be clearly indicated, and there will be no possibility of going astray, the supports and reserves will have no difficulty in following the fighting line, the tendency to over-extension will be checked, and their flanks will, to a certain extent, be protected. On the other hand, they are liable to flank attacks by bodies of cavalry or infantry concealed behind some obstacle, and passing through previously-prepared openings in the fences, and the dispersion of one section of the attacking infantry may quite possibly compromise the success of the whole attack, or at least may cause much loss and delay. The infantry in each enclosure, not being able to see to the right or left, and uncertain of the support of their companions on either flank, will be inclined to move forward timidly and hesitatingly, the attack will be disjointed and irregular, and there will be great difficulty in communicating with the commander of each section. The defender, moreover, aided by his superior power of intercommunication, will be able to oppose a superior force to his opponent at the most threatened points, and to move about his local reserves as occasion may require.

The further advance of the artillery to support the infantry attack will necessitate a repetition of the same disjointed, irregular, and slow advance which brought them to their present position. In order to give a close support to the infantry attack, they may have to move into positions where their range of vision will be still more limited, and from which they will be able to fire in one direction only, though exposed to a concentrated fire of the enemy's artillery. The assailant's cavalry, during the progress of the attack, will be able to act in small bodies only, and its action will be confined to supporting the infantry, and saving them from the attacks of the defender's cavalry. If the position is captured by the assailant, the defender, under cover of his second line of intrenchments, will be able to withdraw his troops without suffering much loss, and the assailant will profit little by his success, unless the defender's troops are greatly demoralized. Should this be the case, and should the beaten troops stray from their previously designated line of retreat, they may be dispersed, broken up, and completely routed. If, on the other hand, the attack is repulsed, the defender may gain some advantage from his knowledge of the ground, but his complete success will be dependent upon the moral condition of his opponent, and upon the measures he has taken for withdrawing his forces.

Viewed from the side of the defender, the attack and defence will present the following features. The defender, on the first appearance of the enemy, will push out detachments of light troops, who, knowing the ground well, will be able to act with much greater boldness than the enemy, who must grope his way step by step. The defender

will have a greater power of concentrating his artillery, owing to his free intercommunication, and he will thus be able to bring a comparatively superior fire to bear upon the assailant's guns, as they are brought up to decisive ranges, and his range of vision being greater, he will be better able to deliver a converging fire. His fighting line of infantry will be concealed in their prepared trenches, and will be to a great extent protected from the assailant's artillery fire, so that the latter's infantry attack will have to be delivered upon troops in a strong position, who have suffered little, and whose power of resistance is, therefore, still great. The defender will, moreover, be able, by means of his concealed local reserves, to reinforce any point which may be threatened, and to assume the offensive when a favourable opportunity occurs.

If the defender is attacked in flank, or from an unexpected direction, his preparations would be of comparatively little value, and the necessity of maintaining his means of retreat, added to the fear of being driven off the roads, amongst the enclosures, would make him inclined to let go the position without being seriously attacked. On the other hand, the assailant, to attack in flank, would have to despatch a force across country, or to make a considerable circuit, and this force would be separated from the main body by the enclosures, and would have little power of communicating with it. If repulsed, its retreat would be difficult.

To attack from any but the general direction dictated by the roads, the force would have to leave the roads, and if repulsed, it would have much difficulty in regaining them.

To repeat the results obtained above, it would appear that a prepared position in enclosed country, such as that described, may be made very strong for resistance, and the attack of such a position will be characterised by the following difficulties:—(1) The difficulty of deployment; (2) of concentrating artillery fire upon the selected points of attack; (3) the splitting up of the attacking force into many sections which have little power of mutual support and intercommunication. Flank attacks will be difficult of execution, owing to the enclosures which would intercept the communication between the force destined to attack the flank and the main body of the assailant's force. In the event of the attack being successful, it will rarely be possible to inflict a severe blow upon the defending force, which, under cover of its second line of intrenchments, and aided by the enclosures, would be able to resist the assailant at point after point, to gain time for the withdrawal of the main body and for obstructing the roads.

It must not, however, be assumed that a defensive position in enclosed country is impregnable, or indeed that it is stronger than a prepared position in an open country. The defender's previously prepared line of retreat, and the instructions for retreating issued to each section of the defence will naturally make him very apprehensive, if attacked in flank, that he may be driven to retreat in a direction which he had not anticipated, and may thus tend to loosen his hold of the position. The advantages of the offensive, moreover, are

not easy to reduce to writing, depending, as they do, upon local circumstances and upon moral feelings. A single weak point may be conceivably sufficient to cause the fall of a position otherwise impregnable, and a position free from weak points, and which fulfils in all respects the conditions necessary to the defensive, can be found nowhere. It must be noticed, too, that such advantages as the defensive may gain from a position such as that described are conditional upon the maintenance of a purely defensive attitude. As soon as the defender proceeds to counter attack, he must relinquish all these advantages, and they pass over in part to the *quondam* assailant. It would seem, then, that the main conclusion to be drawn is this, that the defensive will be characterised by a considerable power of resistance, and of keeping an assailant at arm's length; that troops fighting in a stationary position will have a decided advantage; that the offensive will be costly, difficult of execution, and will rarely promise any results proportionate to the sacrifice it will entail.

(*c.*) *The Attack of and Defence of a Position which has not been previously prepared.*—Under this heading must be included not only those positions in which the defender is unexpectedly and suddenly attacked, but those also in which he may find himself when moving in contact with the enemy, and in which he will generally have at least some few hours to make the most needful preparations. In this case, it will be even more necessary than in the former, for the defender to occupy a commanding position, in order that he may be able to use his artillery with effect, and that he may anticipate flank attacks and turning movements. The amount of preparation he can make will, of course, depend upon the time available, but he will endeavour at least to obtain a front sufficiently clear of obstacles to enable him to use his rifles with effect, and to secure the communication between the parts of his forces. He will endeavour, too, to adapt the line of fences along his front, so as to make them into shooting trenches, and to allow of his assuming the offensive from them. He will naturally not allow himself to be attacked in a position from which there are not ample means of retreat, and some preparations must necessarily be made to facilitate the retirement of his troops by making openings in the fences in rear of the position, and by issuing explicit directions as to the line of retreat of each detachment.

The defenders will nearly always have time enough to make at least these few hasty preparations for receiving an attack. Many of them, indeed, could be carried out during the progress of the action.

The attack of such a position would be marked in its preliminary stage by exactly the same features as that of a carefully prepared position. There will be the same difficulty of deployment, of reconnoitring the enemy's position, of unmasking his fire, and of concentrating artillery fire upon the main points of attack. The assailant's force when deployed for attack will be even more broken up than in the former case, and he will probably meet with resistance at every step. The defender's infantry will line each fence, and dispute the assailant's advance across each enclosure, retiring when hard pressed to the next fence, and passing through openings

previously prepared, and again resisting the assailant's next step. Thus each step will be costly to the assailant, but at the end of it his troops will attain a comparatively secure position where they can obtain cover and re-form, and from which they can fire on the retreating detachments of the enemy. The crossing of the fence will be a matter of difficulty, and will entail some loss. It will in some respects act as a military obstacle, the assailant's troops being exposed to a great extent whilst it is being levelled, or whilst openings are being made in it. At the same time, it must be noticed that the assailant's troops will be keeping down the fire of the defender's troops, by bringing a heavy fire to bear upon them from infantry lining the ditch. Occasionally the assailant's troops may find it possible to pass round the fence by one or both flanks at points which are not exposed to the full fire of the defender's troops, but in general the crossing will have to be done under fire, and at some sacrifice. The defender may be able to bring artillery fire to bear upon his opponent's troops, and occasionally the fences will afford little cover, and in this case the loss will be great, and the attack at this point will not be able to progress.

As the attack draws near to the main position, the resistance will be greater, and the cover probably less, if the defender has had time to take measures to fill up the ditches, or otherwise to neutralize any cover which the fences may afford. Arrived in this position, the attacking infantry will be exposed to a heavy fire and their further advance will be almost impossible until this fire is overcome in some way. The supports and reserves will close up, and a heavy fusilade will be kept up on both sides. The defender, with his superior knowledge of the ground, may be able to push forward infantry or guns, or to have them in concealed positions, so as to attack in flank the assailant's line. If the attack is eventually successful and the position captured, the assailant will rarely be able to inflict a severe blow on the defender, who will retire, offering resistance at each fence. On the other hand, if the attack is repulsed, the assailant's troops will have strong points on their former line of advance, from which to resist the action of a pursuing force.

The advance of the assailant will be marked by the same nervousness and hesitation as in the attack of a prepared position, owing to the limitation of the lateral range of vision of each section. It will frequently be necessary for the attacking infantry to post detachments to guard any lateral openings in the fences till these are secured by the advance of the attack in the next enclosure. The progress of the attack and its eventual success will evidently depend in a great measure upon the action of the local commanders of each section, and upon their intelligent co-operation one with another. The existence of points of comparative security at the fences will tend to check the advance of the assailant's infantry, who will be unwilling to leave the shelter which they have reached at some loss.

The study of the attack of a position has made us acquainted with most of the characteristics of its defence. It has been pointed out how the defender's infantry will be pushed forward, and will resist the assailant's advance at every stage, thus utilizing the defensive

power conferred by each fence. The defender will have, at any rate, a greatly superior power of communication between the sections of his force in rear of the main position, and so will be able to reinforce threatened points. In case the position is captured, he will be able to retire, utilizing all the fences in rear to offer a continued opposition to the assailant. The latter's great opportunity will consist in bringing a large force of guns up rapidly into the captured position to fire upon the retreating columns, and in capturing the enemy's guns before they can be withdrawn. Owing to the difficulty of moving artillery through the enclosure, and over heavy ground, it will rarely be possible to bring up guns in time to act with telling effect.

The defender's troops will also be acted upon by some of the same influences as those of the assailant. They will be nervous of their flanks, and will only be too ready to retire to the protection of the main position. Should this be stormed, it may be found impossible to retire them in their previously arranged direction, and thus, straying from their proper line of retreat, they may fall a prey to the assailant's pursuing forces, should the latter have the presence of mind to take advantage of their demoralization.

As in the attack, so in the defence, the greatest importance will attach to the action of the local commanders, who alone will be able to take advantage of any passing opportunities which may occur, and through whose intelligence and vigour alone the fight can be brought to a successful termination.

The cavalry on either side will have few opportunities for tactical action, and these few will be very passing. They can only act in small bodies, and from behind positions which will screen them from the view of their opponents. They will probably be mainly employed to watch the roads, to give intimation of any intended flank attack or turning movement, and to disquiet the enemy's flanks and rear.

To recapitulate, we see here the offensive marked by almost the same difficulties as in the previous case, but as there has been less preparation, it will have a greater prospect of success, and the many chances of finding cover behind the fences, and concealment among the standing crops, will be all in its favour. The defender, however, always fighting under cover, and resisting the attacking infantry at every stage, will inflict on them considerable loss. The strong point of the offensive will lie in its power of finding cover at points near to the enemy's position, and the assailant by lining the nearest fences with infantry may be able to subdue the defender's fire, or, at any rate, to hold him fast whilst a force is sent to turn the position.

The remarks of General Sherman in his autobiography are instructive as to the power of the defensive, and may be quoted here. Speaking of his campaign in the wooded country of Georgia, where the enclosed ground would probably influence tactics in a way similar to English country, he says, "In wooded and broken countries, the defensive had "a positive advantage over us, for they were always ready, had cover, "and always knew the ground to their immediate front; whereas, we, "the assailants, had to grope our way over unknown ground, and "generally found a cleared field, or prepared entanglement, that held

"us for a time under a close and withering fire." Again, referring to the indecisive results of the great battles, he says, "Europeans fre-"quently criticized our war, because we did not always take full ad-"vantage of a victory; the true reason was, that habitually the woods "served as a screen, and we often did not realize the fact that "our enemy had retreated till he was already miles away, and was "again intrenched, having left a skirmish line to cover the movement "in turn to fall back to the new position."

Thus we shall be justified in arriving at the conclusion that, as in the first case, the defensive will be characterized by a great power of resistance, which will be due (1) to the retaining power of the rifle, (2) to the difficulty of subduing this rifle-fire, (3) to the difficulty of moving troops about in an enclosed country, (4) to the cover which troops remaining stationary will always find, and which a little work will make very complete. An attack, we have seen, may quite possibly succeed: it certainly will be costly, and the results it will lead to will generally be limited to the capture of the bare ground on which the defender stood at the cost of a much greater loss than that of the latter. The effect of the enclosed country in either case is thus narrowed down to one main feature, which may be regarded as the distinguishing feature of fighting in an enclosed country such as England. This feature is the resisting power of the defensive.

In addition to this, the main feature of fighting in an enclosed country, there are also some other clearly marked characteristics. The most prominent amongst these are: the important part to be played by the subordinate commanders; the breaking up of battles into numerous detached fights; the necessity for local reserves; the tactical action of cavalry in small bodies; the necessity for increased mobility. All these are features which have been frequently pointed out as characteristic of modern battles. In an enclosed country, however, they will receive a greatly increased importance.

The study of the influence of the features of the country upon tactics will not be complete without a brief examination into the action of the three arms in detail.

The Action of the Three Arms in an Enclosed Country.

Infantry.—Upon infantry in an enclosed country will fall the chief share of the fighting. This is evident both from the nature of the country and the description of fighting which will be generally resorted to. In order to fit infantry for the part they will be called upon to play, it is especially necessary that they should possess the following qualities:—

1. A high standard of training to enable them to carry out intelligently the orders of their immediate commander, to turn readily the natural features of the country to account, and to take advantage rapidly of any tactical situation.

2. Mobility to enable them to move rapidly through the heavy country, and to pass over the numerous obstacles.

3. Faith in their own intelligence and in the ability of their leaders

to enable them to move forward boldly when they cannot see their way or their companions on their flanks.

4. Discipline to make them ready to obey the impulse of their leaders, to leave unhesitatingly their temporary shelter, to advance or retreat from point to point without demoralization or confusion, and, in short, to be in hand.

It is indispensable that each detachment of infantry, however small, should have ready access to tools, to enable them to level the fences and to improve the natural cover. In such a kind of warfare, no doubt, the spade would play a most prominent part. The easiness of the soil, and the already existing fences, would help to impress upon troops the importance of improving the cover at any point they had won, or at any point they might have to defend. Practice at such work would very soon teach them how cover might be improved, and what nature of trench was easiest to make, and most effective when made. The defenders, resisting step by step the advance of an assailant, would naturally seek for a description of trench which covered them, and yet gave no cover to the assailant when he occupied it. Thus they would probably cut away the rear slope of their trenches and throw the earth up in front, thinking, perhaps, little of the chance of having to assume the offensive at any time. They would learn, too, to make the hedges more of a military obstacle, the great object of which is to detain an assailant under the close fire of the defender. For this purpose the cut down hedges might be made into a kind of abattis, or the fences might be strengthened by half cutting the branches through and lacing them through the lower part of the hedge. At such work intelligent infantry, recognizing the advantages derivable from making the most of the features of the country, would quickly become expert. Similarly, infantry acting on the offensive would learn to take advantage of the cover which they might find at each hedgerow, and to improve it rapidly. They would learn to excavate trenches under cover and concealed by the hedgerows, and to level the fences in their way, exposing themselves but little in doing so. They would seek to make a shooting trench which would admit of their advance, and would yet give them cover from the enemy's fire.

The value of mobility in this description of fighting is very apparent. The loss of the attacking party will be small in proportion to the rapidity of its advance. Retreating infantry, too, will have to move rapidly from fence to fence. Heavily equipped infantry will be at a serious disadvantage in moving through the closely enclosed country, on the heavy ground, and amongst the standing crops. How to lighten the load already borne by infantry, and to render them more mobile, and at the same time to keep them supplied with tools and ammunition, is a problem which, on account of the wide field for discussion it opens up, can hardly be discussed here.

That the action of infantry in enclosed country renders necessary a high standard of training is a proposition which hardly admits of a doubt. As we have seen, it will be broken up into numerous small bodies, each of which will have to fight an action more or less independently of the others; they will be withdrawn almost entirely from

the supervision and direction of the superior Officers, and will have to think and act for themselves in a great measure. In advancing they will have to feel their way, to guard against surprises, to search out enclosures which lie on their flanks, and to co-operate and maintain the touch with the detachments in the neighbouring enclosures. They will frequently be called upon to act against an attack from some unforeseen quarter, or to assist a neighbouring detachment by lining hedgerows on the flank of attacks directed against them. In all such situations there will be no time for referring to superior authority; the Officer in immediate command must act on his own responsibility, and the men must carry out his intentions intelligently. In retirements they will, in the same way, find themselves called upon to act on the judgment of their immediate commander; they will have to await his order for retiring, and then to move rapidly and collectedly. At one time they will have to disengage themselves from an action, at another to move forward to the counter-attack; now they will be called upon to face an attack in front, and again to meet an unexpected onslaught on one of their flanks. In such kind of fighting the moral power, as well as the actual material advantage, conferred by intelligence and training upon good infantry, will undoubtedly be very great.

Cavalry.—The tactical action of cavalry in an enclosed country will necessarily be very limited. Its opportunities will be few and passing; it can act only in small bodies, and its effect will only be locally important. Cavalry, concealed in small bodies, of no greater strength probably than one or two squadrons, behind a wood, a farm, a village, or a fence, may occasionally in the attack and defence render good service. A detachment in an enclosure with an exposed flank will afford a passing opportunity to cavalry if in a position to take advantage of it. Guns moving through the fields, a retiring line of infantry, a hostile force of cavalry unconscious of the nearness of their opponents,—all these are opportunities for the action of small bodies of cavalry, but they must be rapidly seized. The head of an attack may be supported by some small bodies of cavalry moving quickly from cover to cover, which will have opportunities of acting against the enemy's cavalry, and of helping to rally a repulsed detachment, and to check a pursuing enemy. For the carrying out of such duties, cavalry will need to be lightly equipped, well mounted, and to ride boldly. It will be of the greatest importance that it should know the country, and should understand how to get from point to point amongst the enclosures. A superior knowledge of the country will be of great service in assisting it to capture detached guns of the enemy, to cut off detachments, and to do much useful work on a small scale. Although there will not be scope for the employment of a large force of cavalry on the actual field of battle in a closely enclosed country, what may be termed its strategical uses will be important. It will be sent along all the roads, in all directions, round the enemy's flank, and if possible in rear of him, and will be able to render many useful services. It will endeavour to prevent the enemy from breaking the roads along the line of advance of the main

body in rear, and to mend those already broken. It will be sent to act against the enemy's lines of supply, and to break his railroads and telegraphs, to collect supplies and forage, to subdue localities destitute of regular troops, to disquiet the enemy's flanks and rear, to give information of his movements, and to cover any turning movement by occupying the roads along which the turning force will advance, and those in front of them, and concealing its movements from the enemy.

On the defensive, the cavalry will follow the movements of the enemy, break the roads in front of him, impede his advance, and endeavour to give information about any contemplated turning movement. It will likewise seek to threaten the enemy's lines of supply, to prevent him from drawing supplies from the country, and to cut off his foraging parties. In the performance of these duties it will be accompanied by some light guns. It will have to march long distances, to move rapidly, to fight almost entirely on foot, and to be lightly equipped. It will necessarily have to act everywhere in small bodies, and will have to maintain the touch along the whole front covered, to search the villages, towns, and the enclosures generally, and to exercise the greatest vigilance that it is not cut off. All these duties imply necessarily a very high standard of training, and great intelligence in all ranks, and when, in their performance, the cavalry is opposed by a vigorous, powerful, and daring hostile cavalry, upon its action will depend, in a great measure, the result of the campaign.

Artillery.—An enclosed country is evidently not favourable to the use of large masses of artillery. The study of the attack and defence of positions has shown us the difficulty of moving artillery in an enclosed country, of massing guns, and of concentrating fire upon decisive points. In addition to this, the shelter given by fences and their banks and ditches, especially when improved by the spade, will frequently render them quite impervious to artillery fire. The soft nature of the ground under cultivation will, moreover, have the effect of smothering the shells and shrapnel and case bullets discharged by the artillery, and thus their effect will be minimized. In the defence of positions, the difficulty of withdrawing a large force of artillery, and of moving guns for any distance through enclosures, would not improbably have the effect of causing a defender in possession of many guns, to handle them with timidity, and to withdraw them early, thus lowering the *morale* of the defenders of the position. In advancing through an enclosed country, the artillery will have to act in small bodies, to move rapidly and with caution, and to provide for itself a means of retreat through the enclosures in its rear. When not in immediate connection with other troops, it will require a small escort. Although it will be rarely possible to concentrate the fire of a mass of guns on any particular point, yet, when this is possible, and occasionally it will be possible, its moral effect will be very great. As in the case of the other arms of the Service, mobility will be especially necessary for the artillery in an enclosed country. The great difficulty of moving heavy field guns across cultivated land and over fences and ditches, will preclude the use of a large force of heavy guns. Positions

for a few heavy guns near the main roads may be found, but the lightest guns will evidently be best suited for moving in such a country, and these will have to work in small bodies, and to a great extent independently, except when the force to which they belong is resisting an attack. The same qualities which are necessary for the infantry will also be equally necessary for the artillery. Their commanders will need tactical knowledge to appreciate the points within their range of vision upon which it is most desirable to concentrate the fire of their guns, and to assist them in co-operating with the infantry in forcing the enemy's position. In advancing or retiring they will have to take advantage of the cover afforded by the neighbouring fences, and to change their formations according to these fences. They will have to know the ground and the country generally well, and should be able to retreat or advance rapidly without being caught in any of the enclosures. Opportunities will frequently occur when they will be able to take advantage of some concealed position, and to enfilade an advancing or retiring line from a position of security behind a fence. Thus, as is the case with the other arms, the successful handling of the artillery will depend on the skill and enterprise of its leader, and upon the intelligence, training, and discipline of the men.

Supply of Ammunition.—An enclosed country will doubtless add much to the already great difficulty of feeding troops in action with a sufficient and regular supply of ammunition. The battalion carts of the infantry will find it no easy matter to follow their battalions through the numerous enclosures and across the fences which separate them. In addition to this they will frequently be much exposed, and a single shell may destroy the cart and scatter the ammunition, which in the hurry of an advance through enclosures would be soon lost sight of and forgotten. Carts left behind in concealed positions will be liable to be separated from their battalions, and, in the moment of need, will probably be missing. The divisional small arm ammunition columns will have to be broken up and attached to battalions, and will need to follow their movements as closely as possible. The numerous detached fights will occasion a great expenditure of ammunition in certain localities, and when the supply fails, the result must inevitably be serious. It will undoubtedly be indispensable that each detachment should have a sufficient supply of ammunition within easy reach, so that at no time the men's pouches may be quite empty.

The ammunition cart may be suitable for troops occupying a position where long-continued advances or retirements are not made, but in the case of the attack of a position, or in retirements through enclosed country, some other means of transporting ammunition, such as on mules or ponies, would be much more suitable. The objection to the ammunition cart appears to be that, in moving through an enclosed country, it will frequently have much difficulty in following the force to which it is attached; that it will be much exposed to infantry and artillery fire, and will rarely be able to advance very near to points where a close fire is being maintained, and therefore the services of men will be required to unload it and distribute the ammunition; and that it will carry the ammunition supply in a too concentrated

form, considering the numerical weakness of the individual sections of the fighting line in each enclosure. Recent events have demonstrated clearly the paramount importance of devoting the greatest attention to the transport, the care, and the supply to troops in action, of reserve ammunition. It has become apparent that the efficiency of the modern breech-loader is vitally dependent on these points; and in view of the improvements in small arms which are already being attempted, it seems to be certain that the question of ammunition will play a very important part in the battles of the future. The effect of enclosures upon a force of infantry in action, splitting it up into numerous fractions of varying strength, will add much to the already great difficulties of this question. The artillery ammunition supply, too, will be a matter of difficulty, as the batteries, especially in an attack, will frequently stray far from each other, and these detached batteries will generally be the very ones which most need a supply of ammunition. The heaviness of the soil will be very unfavourable for moving the heavy ammunition wagons for any distance across country.

Such are some of the peculiar features attending tactical operations in an enclosed country. The fact must not, however, be lost sight of that they apply strictly to a closely enclosed country, that they will be modified where the country is less enclosed, till eventually they disappear altogether as the country becomes open. We must remember, then, that inasmuch as the country is much more closely enclosed in certain districts than in others, that the conditions above described have in such districts a more rigid application than elsewhere; that in other districts they have only a partial application, and that they disappear more or less entirely in those open spaces which are to be found in certain parts of the country. Therefore, troops operating in England must be trained not only in the peculiar methods of fighting in a closely enclosed country, but also they must be prepared to engage an enemy under ordinary tactical conditions in an open country. These considerations seem to lead us to the conclusion that, to operate with effect in such a country as England, a higher, not as is sometimes assumed, a lower standard of training and discipline is absolutely necessary.

3. *Their Influence upon Strategy.*

The many peculiar features of Great Britain will doubtless produce an effect more or less marked upon the strategy of armies operating within the country. It would appear in the first place that there will probably be an almost complete absence of grand strategical combinations, of wide turning movements, and of extended manœuvres. The reasons for arriving at this conclusion are sufficiently obvious. When we remember the conditions which act as incentives to strategical manœuvres, such as long and indented lines of communication, difficulties of procuring supplies on the side of one or other of the combatants, the existence in the theatre of war of some great strategical obstacle, peculiar conformation and extent of bases, or of frontiers, &c., and when we remark that such conditions will be almost all conspicuous by their absence from military operations in this country,

we shall perceive that we are amply justified in the above conclusion. At the commencement of a campaign, the operating armies must be at no great distance apart, probably if one army is covering London, and a hostile force based on the sea coast, they will be in close proximity with each other. Therefore to act against the communications of its opponent, either army would have to move over a distance very great in comparison with its distance from his front, and would thus uncover more or less completely its base, expose its communication, and confer upon the enemy the advantage of very much shorter interior lines. The force, moreover, which made a wide *détour* from its direct line of advance or retreat, would be in danger of finding itself in close proximity to the sea. The existence of this very important and impassable obstacle on the borders of the theatre of war would thus act as a check to wide strategical manœuvres. On this point, the words of a writer, published at the commencement of the present century, are, perhaps, worth repeating.[1]

He remarks: "The limited extent of this country would enable an "enemy, if he were at first successful, to push any defeated corps to "extremity, and force it either to lay down its arms, or drive it into "the sea. The long band or neck of land which the country forms "might enable him, by landing detached corps on the flank, or flanks, "of the principal line of operations, not only to deprive the country of "the co-operation of its different parts, but to operate himself on the "rear of our chief line of operations, which could not but be attended, "in the present circumstances, with the worst physical as well as "moral influence on the troops."

The writer of these remarks, however, seems to have left out of account the rather obvious truth that the first of his conclusions is at least as applicable to the invader's corps as to those of the invaded country.

It must not be assumed, however, that in a country like England, there can never be any opening for strategical combinations. Circumstances may easily be imagined which would give an opportunity for the display of strategy by a skilled leader. If in command of an army superior in mobility to that of the enemy, he may seek to take advantage of the proximity of the sea coast, and to throw his adversary back upon it. Again, if in command of an army acting within its own frontiers, he will have the choice of many points on which to base himself, and may make use of this advantage to act against the communications of his opponent. It may happen, too, that more than two armies are operating from different points in the theatre of war, a condition which would doubtless lead to some manœuvres; or one force may have a movable base such as a fleet, in which case its commander would be sure to profit by this peculiarity to manœuvre against the rear of his opponent, although it must be remembered that the difficulty of finding suitable landing places would place a limit to this advantage. All these conditions, however, are sufficient to show that circumstances may exist which may

[1] Captain J. F. Birch, R.E.

lead to strategical manœuvres. We must, therefore, content ourselves with observing that, considering that one army will generally seek to cover London, and the other to operate against it from the coast, extended strategical manœuvres will be very improbable; and that, in any case, whatever may be the strategical objects of either side, the general features of the country are not favourable to such manœuvres.

The smallness of the theatre of war, and the consequent shortness of the lines of communication, will have another effect upon operations, for no important deductions from the fighting strength of either army will be necessary for guarding these lines, and for garrisoning important strategical points. An army, based on the coast, will, of course, require a force to guard its base there, as also its opponent will require a garrison for the capital and other important points which the enemy's advance may threaten, and which are strong enough to force him to resort to siege operations for their capture; but beyond this no considerable deductions will be necessary, so that, whether a decisive action is fought near the coast, or near the capital, will matter little as regards the fighting strength of either combatant from this point of view.

The railway lines would doubtless confer great advantages upon the side which had possession of them, and was able to work them, but these advantages are probably not so great as at first sight may appear. Here again the size of the country comes in to limit the advantages which would be most important in a large theatre of war, or where the operating forces were at a great distance apart at the commencement of operations, and where their fronts were connected by lines of rail. When these conditions exist, as was the case, more or less, in the American War, the Danish War of 1864, the Austro-Prussian War of 1866, the Franco-German War of 1870, and the recent Russo-Turkish War, the railways will always play an important part in strategy. Experience, however, has shown that the transport of complete army corps or divisions for short distances, cannot be accomplished in a shorter time than by marching them, and therefore when the lines of communication are short, and the distances apart of operating armies is inconsiderable, railways play only a subordinate part. At the same time this part in a country like England where troops must be entirely restricted to the roads in their marches, and where these are narrow and closely enclosed, though a subordinate one, will be a most useful one. In the first place, the railway lines will be used for the conveyance of small bodies of troops to their places of mobilization, then for the mobilization of army corps, and for their conveyance to the point of assembly of the army to which they belong, and also for the conveyance of the army, or of the less mobile parts of the army, to any point of the theatre of war. The number of lines of rail in the country will ensure these operations being easily and rapidly carried out. During the progress of operations the railroads would be exceedingly useful in the following ways:—(1) In relieving the pressure upon the roads by conveying dismounted troops; (2) In bringing up reinforcements, withdrawing garrisons, &c.; (3) In con-

veying the sick and wounded to the rear and thus relieving the operating army of their care, and maintaining its mobility; (4) In bringing up supplies, ammunition, &c.; (5) In acting as a road for marching troops along, when not used as a railway. In these points the railroads would render great auxiliary service. The power of conveying by rail dismounted troops which might be in need of rest, or of sending small bodies to the rear to prepare positions, and of getting rid of the sick and wounded, and the labour involved in their care, would greatly assist an army in maintaining its mobility and power of manœuvring. It must be noticed, however, that the possession of the lines of rail, and their maintenance in working order, necessitate the employment of a force to guard them, for railways are very easily rendered temporarily unworkable, although some labour is necessary to inflict such damage on the road as is difficult to repair quickly. Therefore, when one force has possession of lines of rail which cannot be used by the other force, and the two forces are in close proximity to one another, the former force will have to keep the lines of rail guarded, and its strategical movements will be straitened by the danger of exposing its railroads.

The abundance of the telegraph lines is no doubt a feature of some importance, and would greatly facilitate the operations of a commander who, retiring or making a stand in his own territory, had destroyed the telegraph lines in front of him, and was master of those in his rear and on his flanks. The possession of such complete telegraphic communications would limit the use of the field telegraph to tactical operations. In case the possessor of the telegraph lines was acting on the defensive, and had taken up a position, he would frequently be able to make use of them for tactical purposes, whilst the assailant would find great difficulty in laying down lines in an enclosed country.

Another advantage of the possession of the telegraph lines may be noticed as having, as we shall afterwards find, a peculiar bearing upon operations in this country. This is the advantage that an army, which has detached a force to act against its opponent's communications, will gain by having its separated fractions in telegraphic communication with each other. Speaking of this, the author of "The "Operations of War" says:—"In the case of attempting to dislodge "an enemy by sending a detachment against his rear, the telegraph "will both diminish the risk of the movement, and increase the "chance of gaining its complete results."

The plentiful supply of water transport might possibly prove of great benefit to one or other side, being used either as a means of supply, or to transport armies from one point on the coast to another, to act against the rear of an opponent's army, who had not the same power of moving troops. This description of strategy, however, implies a protracted campaign, and would only be called into play by exceptional circumstances. Water transport might be useful also to bring up reinforcements and supplies, and to relieve the railroads, when they were being used by the operating armies, especially when their use does not render necessary a wide circuit.

The absence of permanent fortifications in the interior of the country would make it necessary for a defender to give up to his opponent all places on the line of advance of the latter which he could not directly cover with his operating forces. In other ways, also, this disadvantage would be felt to be a serious drawback. An army acting in its own territory would miss those pivots to operations which frequently are of the greatest service, especially to an army inferior in strength or in manœuvring power to that of its opponent. In the same way the operating armies would miss fortified points which might act as temporary or secondary bases, as guards to strategical points, and which, in numerous other ways, might give strength and security to their operations. At the commencement of a campaign, the loss to a defender inferior in numbers, who was compelled to retire, and so to give up large towns and wealthy districts to his opponent, which a few permanent works would have rendered temporarily secure, might quite possibly be overwhelming. Doubtless this want might, at the outset of a campaign, be, to a certain extent, supplied by the creation of field works and intrenched camps, if time should allow; but these, unless armed with a powerful artillery, which would rarely be the case, would not be able to keep an assailant at a sufficient distance from the places they covered, to prevent his bombarding them and destroying the valuable property, which it would be their object to protect.

The permanent fortifications which are situated at different points along the English coast, would render it necessary for a hostile force, based on the sea coast at any point not very distant from any one of these works, either to reduce it, or to detach a force to mask it, lest the garrison, issuing out upon the rear of the enemy's army, should sever his communications with his base on the coast, or should, perhaps, destroy the force covering this base. These extensive and important fortifications along the coast of the country would require large garrisons during the progress of operations within the kingdom, and it might be urged that the creation of numerous fortified points in the interior, by increasing the number of garrisons to be provided, would sap the strength of our defensive armaments, which in such an emergency, when the wealth of the country lay at the mercy of the enemy, few, even of our own countrymen, would regard as unnecessarily bloated; and would reduce to a minimum the force destined to act against the enemy in the field, upon which the result of the campaign would eventually depend. This is an argument which has occasionally found expression, but it is open to the obvious retort that such a use of fortifications is manifestly a false one, for it violates the great principle upon which the application of fortifications in war is based. This principle is to the effect that the great object of fortifications is to enable the few to make head against the many; and the effect it should have upon the side which is in possession of fortified points, is to increase, not to decrease, the strength of the forces available for field operations, by allowing small forces, aided by works, to hold in check, or to occupy, a much stronger force of the enemy. It must be remembered that the

existence of fortifications does not render it imperative that they should be garrisoned, if they are without the range of operations, or if their retention does not make it worth while. But, however this may be, it cannot but be apparent that the existence of so many large, important and wealthy towns, without any means of protection whatever, except that which could be derived from an army in the field, must be a serious point of weakness in a campaign in England, to the country.

The density of the population, the number of large towns and centres of industry, the amount of accumulated wealth in the country, are all features which combine to guarantee to armies operating in the United Kingdom, whether hostile or friendly to the population, an ample supply of provisions. The system of requisitioning would be carried out in the most complete way. The effect of this plentiful and easily obtainable supply of provisions on strategy would be to render armies more free to manœuvre, and less careful to confine their strategical movements within points where they could be supplied from the rear. Thus, an army would not hesitate to cut itself adrift from its line of communications for a few days, or for more, from any fear of not being able to live on the country. These remarks apply mainly to the great central plain and the southern counties. It is possible that, should operations extend to the mountainous regions of Cumberland or North Wales, there might be some difficulty in feeding armies.

These last-named features, combined with the unprotected state of the interior, would have another and a yet more important effect upon military operations, and indirectly upon strategy. The enormous loss which would be inflicted upon the defenceless towns through bombardments or by forced indemnities, and upon the country generally, by the paralysing of its industries, added to the overwhelming cost of modern war, would make a long campaign an insupportable burden. In this respect this country seems to present conditions exactly the reverse of those which mark such a country as Russia, for example, where the theatre of operations is almost unlimited in extent, the population very sparse, and which, in the memorable campaign of 1812, was not subdued by the capture of its capital. In this country, on the other hand, it is easy to understand that the nation might be reduced to subjection without the capital having fallen, or even being endangered. It seems, therefore, that taking into consideration these circumstances, and bearing in mind the proximity of the capital to the coast, and the enormous cost of modern war, a campaign in this country must almost certainly be an affair of short duration. When this is the case, the influence of some of the features noticed above upon military operations would not be observable, or would appear only in a modified form; but since it cannot be absolutely certain that a campaign would be brief, it is desirable not to leave them entirely out of account.

The number of large towns, from which lines of rail radiate in all directions, would also increase the powers of manœuvring of armies.

Any of these towns surrounded by an intrenched camp could be easily made into a useful base of operations.

The enclosed nature of the country would influence strategy by throwing armies upon the comparatively narrow roads in their marches, and thus rendering them less mobile, cramping their movements and making their progress irregular. On this point General Hamley remarks: "In England it would be difficult to find spaces of any "extent where armies would not be restricted to the roads while "marching, or where they could easily form front for battle." These closely enclosed roads would act in some sort as defiles, and a break in them, or resistance at any closely enclosed point, would occasion great delay in the advance of the troops. The breaking of all the roads along which an army was advancing would check its advance for a considerable length of time. It would be necessary not only to repair the roads roughly, so as to admit of the immediate advance of the combatant troops, but also to make them permanently traversable, in order that they might be in a condition to be used by the numerous supply columns which follow an army, and to afford a secure and rapid means of retreat, if needed, to the army. A narrow road in bad repair would occasion, as it is easy to suppose, the greatest confusion amongst the numerous columns proceeding along it, and the breaking down of any carriage would cause the rear of the column to straggle, and would add much to the already great difficulties of the advance. These long straggling columns would be liable to attacks in rear and on their flanks from troops concealed amongst the enclosures.

The resisting power, which enclosed country confers upon an army maintaining a purely defensive attitude, will have its own influence upon strategy. We need only turn to the campaign of the American War to see how such a power may be turned to account. In Sherman's campaign, in Georgia, the superiority of the defensive was very marked, and there is no instance recorded of an attack upon a position being successful, where the troops were not demoralized by circumstances not connected with the attack. This superiority was taken advantage of by Sherman to manœuvre the Confederate Army from position after position, a force being left in front of the position, and a second force being detached against the rear. The defender was thus reduced to accept one of three possible courses. He might attack the force intrenched in front of his position, to do which it would be necessary to give up the position and to attack a strongly intrenched force, thus conferring upon the latter the advantage to be derived from the superiority of the defensive in the peculiar enclosed country. The detachment against the rear of the position would occupy the position with little or no opposition, would intercept the line of retreat of its opponent, and would attack him in rear. In the second case, the defender might endeavour to attack the second detachment, to do which it would be necessary also to leave his strong position, which the watchful force intrenched in front of him would immediately occupy, following up the success by trying to drive him from his line of retreat and to enclose him between the two detachments. The third course open to the defender was to quit his strong position and to

retire, covering his communications. This course was, in fact, adopted more than once by the Confederate leaders, notably at Dalton, and again at Kenesaw Mountain. This peculiar offensive use of the power of resistance is worth more than a passing notice in connection with the enclosed nature of English country, in which it would, doubtless, play an important part. It must be noticed, however, that the numerical superiority of Sherman, when he made use of this form of strategy, was so great, that each of the detachments of his separated army was equal in strength, or almost equal, to the whole force which his opponent could bring against him. It is apparent that to such manœuvres there must be some limit. When the divided parts of the army, which seeks to turn a position by detaching a force against its rear, are each too weak to hold their own alone against the attacks of the united force of the defender, even with the aid of the resisting power of the enclosed country, this manœuvre must prove fatal to it. The defender will reap the great advantage derivable from attacking in detail the separated parts of an army, and he may contain the force acting against his rear, and crush that in his immediate front, in which case the former force would find itself in a desperate condition. His own force would be acting on interior lines, and could concentrate rapidly against either detachment of the enemy. Again, another limit to these manœuvres would be found in the distance by which the two detachments were separated, by their means of communicating with each other and by their power of re-concentrating. When the turning force had to make a very wide circuit, the defender would have ample time to manœuvre against either detachment, or to act against the detachment in his front, while breaking up the roads in front of, and containing, the other detachment. It is highly probable that the resisting power conferred by enclosed country upon troops in position, as well as the costliness of direct attacks, and also the difficulty of attacking armies in motion, will all prove incitements to adopt this form of strategy. As we have seen before, the success of these manœuvres will be rendered much more probable, when the separated detachments are in telegraphic communication with each other. Their effect upon the commander of an army acting on the defensive would probably be to cause him to extend greatly his front, and to cover as much country as he dared, occupying strongly all central points, and only watching the remainder of the ground, trusting that the difficulty and the necessary slowness of deployment would ensure his having ample notice of an intended attack, and that his telegraphic communications, and his superior power of massing troops, would enable him to collect his forces on any threatened point sufficiently rapidly to meet his opponent with relatively superior forces.

From the consideration of these preceding questions, it follows clearly enough, that in enclosed country the action of containing forces will acquire vastly increased importance, and that such forces will be able to hold in check greatly superior numbers long enough to allow of decisive action in another part of the theatre of war.

To express in a few words the influence of the features of the country upon strategy, it would seem that, in the first place, a cam-

paign in England would be short and decisive; that great strategical combinations would be rare; that the absence of fortifications makes the wealthy towns very vulnerable points; that the enclosed nature of the country will cramp movements, render tactical successes difficult, and provoke turning movements and the separation of forces; that railways and telegraphs will render much valuable aid of a subordinate character, and that supplies will be plentiful and easily obtained.

Into the consideration of the influence of the features of English military geography upon military operations, comes the following question, occupying a place midway between tactics and strategy, and having an intimate connection with both, viz.: Could armies operating in this country find positions for pitched battles? It is frequently remarked, it is not uncommonly laid down as an incontrovertible fact, that, on account of the nature of the country there is hardly any place in England where a battle could be fought. It will be worth while devoting a little space to inquire into the truth of this statement. It must be remembered, in the first place, that as a general rule it requires the consent of two parties before a battle can be fought. The side which is acting on the defensive must first await the attack of its opponent in some chosen spot, and then the latter must attack the position, or must adopt some manœuvres to force the enemy to quit it. Battles are occasionally brought about, as at Mars-la-Tour, by the determination of an assailant; or, again, as at Wörth, by accident; but such engagements are the exception to the general rule above mentioned. The general object of the side which assumes the offensive is not only to gain possession of the actual position occupied by the defender, but to inflict on the latter a blow, both material and moral, and to destroy or diminish his power of resistance to the accomplishment of the strategical objects of the former. The defender, on the other hand, seeks with the aid of his strong position to shatter the assailant's attack, to destroy his offensive power, and then to issue from his position and overwhelm his already beaten and dispirited foe. It has been stated, as the result of previous inquiry, that an assailant may capture a position in enclosed country, but that he can rarely hope to inflict a severe blow upon the defender. Here, again, some useful lessons may be learnt from Sherman's Georgian campaign. The result of all the fighting which took place during the campaign seemed to show that in enclosed country tactical operations are prodigal of life, but rarely attended by any decisive success. The assailants were invariably repulsed, but the defenders were ever unable to follow up their success, and to inflict a blow upon their retiring adversaries. The losses of the assailants were always out of all proportion greater than those of the defenders, who fought behind parapets. Where such conditions hold, the commander of the army which has the initiative will, doubtless, always prefer to manœuvre his opponent from his position by some such strategy as that of Sherman. A skilful defender, however, would soon perceive and profit by this unwillingness to attack; and would seek to occupy positions which could not be turned without difficulty, or to extend his front to make turning movements more difficult. He would endeavour thus to find positions combining

strategical with tactical advantages, remembering that the real secret of an advantageous defensive position consists in the choice of a place, which is not only tactically strong, but which the assailant can only avoid attacking at the risk of conferring on him some strategical advantage. By occupying such positions a skilful defender may force his opponent to attack him at all hazards. In this way the commander of the offensive force might be compelled to drive the defender backwards step by step; or, again, the commander of the force acting on the defensive, seeing himself manœuvred from one position after another, might at length be compelled to resort to offensive operations, and to attack his enemy in turn. Thus fighting would be brought about in an enclosed country, which, though perhaps not deserving the name of a battle, and very different from the old idea of a battle, which implied the meeting of two hosts on a plain, would partake of the characteristics of modern battles, and would, in the matter of bloodshed, have little cause for humility.

But it must be borne in mind always that the country is not everywhere so closely enclosed as to make the above peculiarities universally observable. The enclosures, as has been previously shown, vary in different parts of the country, and in some parts open spaces are by no means uncommon. In the great belt of country occupied by the chalk strata, which includes the downs of Kent, Surrey, Sussex, Hampshire, Wiltshire, Hertfordshire, and Dorsetshire, the enclosures differ greatly in character from those of other counties. Vegetation is scarce, the trees are few and stunted, the downs form numerous extensive open spaces, and parts of the country, such as Salisbury Plain, are hardly enclosed at all. The soil is light and dry, and the abundance of pasture land is favourable to the movement of troops, the view is little restricted, and the fences are insignificant as obstacles. In parts of the county of Somerset the country is not strictly enclosed, and the fields are large; and in Devonshire and Cornwall there is much open ground. In any of these counties it would undoubtedly be possible to fight a decisive battle under conditions varying little from those applicable to the great battle-fields of the Continent. It would not, of course, be possible to find ground upon which two large armies could manœuvre with absolute freedom in unbroken lines, for the extent of ground occupied by modern armies is very great (*e.g.*, the French position at Gravelotte was 7 miles in extent); but ground might be met with sufficiently open to allow of a decisive action being fought, the enclosures merely forming features of the battle-ground. It will be seen that this open country surrounds London on all sides but the north-east, and therefore in the case of an army advancing from almost any point on the coast against London, ground must be passed over which is, in a greater or less degree, suitable for tactical operations. It might happen, of course, that the line of advance fell through that part of the country which was least open; and in such a case it cannot be expected that the modern practical mind would fall in with any suggestion that the two armies should make a day's march to some suitable ground, and there settle their differences, although such a course might remove a load of difficulties from both combatants. If this should

happen there would probably be much fighting, great losses, and small results. With regard to the part of England which is most favourable for tactical operations, it must be noticed that it forms two bands[1] running generally from east to west, and that the breadth of these is inconsiderable; therefore in case an army was marching from the coast against London, there would generally be space only for one or two decisive actions. It might occur that an army, after an indecisive engagement, might take up a second position a few miles distant from the first, and again prepare to receive the enemy, or the assailant might be marching along this band from west to east, or from east to west, and in these cases more than one action might be fought; but in marching across the band one decisive action would prevent the beaten army from making a stand till it had retreated beyond the limit of the ground where a battle could be fought. As regards the remaining part of England, it must be confessed that, north of Hertfordshire, there are very few places suitable for decisive actions. Open spaces indeed there are here and there, but these are like oases in the middle of a great desert, are generally in positions which are not likely to become strategically important, and so are unlikely to become battle-grounds, except by mutual consent. It would appear, therefore, that that part of the country which alone is suitable for tactical operations of a decisive character lies to the south, south-east, south-west, and immediately north of London; that in these southern counties the ground is in many places well suited for such operations, and that north of Hertfordshire the country is generally too closely enclosed to be fitted for battle-grounds, except in some few and widely separated districts.

The subject thus far considered has for us an interest indeed, but an interest which is so general as to be rather remote. To the soldier, who before all things must be a patriot, such military lessons are interesting, not as matters of abstract science, but from the bearing they have upon his fatherland. He seeks naturally, therefore, for some narrower issues to these general lessons, having a direct and immediate bearing upon his own country. In order that these may not be wanting, it is now proposed to advance a step farther, and to imagine ourselves called upon to act against an enemy in our own land, and to consider, in such a case, how we could best profit by the lessons in strategy and tactics, which we have learnt from the previous inquiry. It is not intended to enter into any great political or strategical questions, but to consider merely the strategy and tactics which might be employed against an enemy who had landed a force upon our shores. Such a force we may suppose to be disembarked on the coast under one of two possible conditions. The first is that the force possesses a reasonably secure line of communication with its own territory, or in other words, that it has command of the Channel. The second

[1] It would, perhaps, be more correct to say that the chalk country forms three bands running generally east and west. Of these, 1 (the county of Hertfordshire) is on the north of London, and 2 (the north of Surrey, and a strip running along the south coast, which unites with the former in the county of Kent on the east and again in Hampshire on the west), lie to the south.

supposes that the force has been landed by stratagem, and that it has no means of retreat to, or communication with, its own land, but has been risked in this position in the hope that it may be able to fasten on the vitals of the country and subdue it, before it suffers a reverse. In the first case, the force will have to maintain its communications with its base on the coast; in the second, it will march self-contained, or will, perhaps, seize some large town, fortify it, and adopt it as a temporary base. With the possibility of such an undertaking, we have no concern here, and are therefore free from the necessity of showing any sympathy with the vague alarmist fears of the few, on the one hand, or with the soothing belief in our absolute and unconditional security of the many, on the other.

Before proceeding to discuss the best line of strategy to be adopted, one further supposition is necessary, which is, that we have mobilized, and assembled at some central point, an army at any rate not greatly inferior in numbers and in the quality of the troops to that of the enemy.

The Strategy of the Defending Army.—To arrive at the line of strategy to be pursued, it is necessary to be acquainted, not only with the objects which we desire to carry out, but also with those of the enemy. In the present case, those of the latter will be, shortly, to fasten on the capital, or upon the wealthiest and most vulnerable points of the country within his immediate reach, and thus to procure its submission. The defender's objects, on the other hand, will be, first, negatively, to frustrate those of the invader by guarding the capital, and all the territory he can; and second, positively, to thrust back the invader's army upon the coast, and to capture or destroy it.

The presence of the enemy's army on our coasts is sufficient guarantee that he is both able and anxious to take the initiative in the campaign, and therefore it is probable that, in the first instance, our strategy will be confined to the carrying out of the first or negative objects. It must not, however, be forgotten that, if it were possible, it is certainly desirable that we should at once take the initiative, and endeavour to recover the loss of moral power, which the presence of the enemy's force within our boundaries will have caused. When the relative strength of our armies does not permit of this course, as may be assumed to be the case, it becomes our duty to consider how the features of the country may be turned to account in carrying out the object of frustrating the enemy's strategy. Our former conclusions will have made it clear that no great advantage can be hoped for by drawing the enemy on into the country, and that the relative strength of the armies will differ little on account of deductions to be made for guarding communications, &c., especially if the enemy marches self-contained; but on the contrary, that the country will suffer both in *morale*, and in the paralyzing of its industries, by allowing the invader to advance far inland. Therefore, the first conclusion we are brought to is, that the invader's advance must be resisted from the point nearest to his landing place, to which it is possible to dispatch the defending army. This force must therefore be moved, as rapidly as possible, from its central position to this point.

If the invader has two armies at different points on the coast, a retaining force must be sent to hold one of these in check, whilst the whole weight of the main army must be thrown against the other; the railways, if the two points are far apart, being used to transport a preponderating force from one point to the other, as needed. The defender must seek to gain the greatest advantage from the great tactical feature of the country, the resisting power of enclosed country; and must endeavour to force the invader to fight for every step of advance he makes, and thus to draw as much blood as possible from him, always fighting, himself, from behind cover, and therefore suffering comparatively little. Meanwhile, strong positions should be prepared at all possible points, one behind another, as close as the nature of the ground will allow. For this purpose, civilian labour might be employed, and gangs of men might be directed by Officers. It must be remembered that time would be necessary for the preparing of these positions, and therefore the enemy's advance must be rendered as slow as possible. The railway lines endangered by his advance should be completely broken as the defender retires, so as not to be available for marching troops along, and preparations should be made for breaking the railroads covered by the defender, so that no delay need take place when he has to retire. The rolling stock should be all withdrawn to positions covered by the defender, or destroyed; the telegraphs available for the invader should be completely destroyed, and the roads, as the defender retires, thoroughly broken. All these defensive measures would require a considerable time, and some of them would be difficult to carry out, since they would have to be done between the retirement of the defender and the advance of the invader. Measures might be taken, however, to aid these preparations by preparing all possible places on the roads and rails for demolition in anticipation of a retreat.

The attempts of the invader to turn the defender's positions may be met by occupying central points on a considerable front, the defender depending upon his superior power of concentrating upon threatened points. The roads in front of the flanks which could be used by the enemy in such turning movements should be thoroughly broken, and the flanks carefully watched. A detachment pushed out to meet the turning force would, by occupying the roads, be able to contain it for a considerable time, and the defender, with his central position, his superior communications, and his telegraph lines, would be able to resist the enemy on both lines, to act offensively, if opportunities occurred, and to send light columns to threaten his rear and communications. It must be noticed, however, that if the enemy were acting under the second of our conditions, viz., without having command of the Channel, and had no communications to maintain, he would be in a measure free from the influence of forces acting against his rear, except that, as he would necessarily have to carry with him a large supply of ammunition, the actual rear of his force would be vulnerable. In such a case he would be free to manœuvre in any direction, but would be to some extent hampered by his extensive transport train, by the necessity of directing his marches upon

large towns, and by the time needed for collecting supplies. The defender, on the other hand, though free to base himself upon many places, would not dare to uncover the capital, unless it were surrounded by works, and occupied by a garrison.

To attempt the destruction of all the supplies and property which might be of use to the invader, would be a task of enormous magnitude, and one involving so great a sacrifice as to injure the defender probably as much as it would the invader, and therefore it would never be attempted.

The means to be taken for the defence of the capital would necessarily depend upon the time available. The defender must endeavour to improvise a system of strong field works, covering all the approaches, into which his forces will have to retire if hard pressed. Their nature and their positions must be determined beforehand, so that no delay should occur in throwing them up.

When the defending army arrives in any country where a general action may be fought, it will depend upon the state of its troops, the relative numbers of the two armies, and the strength of its position, whether its commander determines to stand and risk the fate of the country upon a general action, or to continue his retirement, disputing the ground step by step. If the latter course is adopted, it will be necessary to make no stand in the open country, but to regain the protection of the enclosures.

It must be borne in mind, however, that this form of strategy must have an end, and is only to be pursued in order to bring in the aid of some other conditions, such as time, reinforcements, the wasting and loss of the enemy's forces, or to permit of some offensive action in another part of the theatre of war. The defender must eventually take the initiative, and drive the enemy back, if his strategy is to be successful. However successful his resistance to the invader's advance may have been, however slowly, painfully, and with great cost the latter may have won each step of his forward movement, yet no real advantage will accrue to the defender, unless he is able in the end to reverse his strategy, to take the initiative, and to drive back the invader. Should he be driven back, step by step, till at length he is forced to enter the defences of London, his position will be a desperate one. The command of all the lines of rail will have passed away from him, his communication with the rest of the country will be almost destroyed, the extent of ground he will have to defend will be enormous. The invader could without difficulty cause immense loss by bombarding the town and buildings, and could probably destroy the railway depôts and rolling stock, and this without attempting to capture the defender's works. He could also mask the defender's army, if he did not think it worth while to proceed to attack the forts, and send a force to subdue the most important towns and districts in the country. If he could obtain a supply of rolling stock, he would be able to make use of the many lines of rail, and the country would be at his mercy. The effect of shutting up 4,000,000 inhabitants within the works of London has been well pointed out by Captain Hozier in his work on "the Invasions

"of England." If the defender were able to garrison the works of London, and yet to maintain a sufficiently powerful field army, his chances of ultimate success would be greatly improved. He might possibly move part of his field army into these works, and reinforce it by withdrawing all the garrison from places which were either not threatened, or the fall of which would not be of supreme importance.

To repeat in a concise form the main heads of the strategy suggested, it is essential that the invader should be met at that point nearest his landing-place to which it was possible to dispatch an army in time; that the resisting power of enclosed country should be called into the aid of the defender to help him to dispute the invader's advance yard by yard, and to draw as much blood from him as possible, the former meanwhile suffering little; that the roads, railways, and telegraphs in front of the defender should be thoroughly destroyed; that strong positions on the line of retreat of the latter should be prepared one behind another; that turning movements should be guarded against by occupying central points on an extensive front, or by the use of detachments pushed far out to the flanks; that the capital should be defended by a series of works on all the approaches, but that the defender should strain every nerve to turn the balance before he is driven into these works, and to stop the invader's advance, and eventually to force him to retreat.

In all these points it is evident that the great desideratum is to be ready in time, so that the defender may meet the invader close to his landing-place. Should the former be taken by surprise, he would lose his greatest advantage, and the enemy might in a single day traverse ground which, if occupied by the defender, would cost him a month and great loss to win. A couple or three days unopposed might see him at the very gates of London, when resistance would be of little avail.

The Tactics of the Defender's Army.

The study of the line of strategy of the defender will have made us acquainted, to some extent, with the tactical system which it will be desirable to adopt. Assuming, as has been done, that the invader will seize the initiative and seek to attack the defender wherever he may be found, the latter will come into contact with him at once, and will naturally take all the advantage he can from the resisting power of enclosed country. Fighting always from behind fences, and under cover improved by the spade, he must make the invader fight for every step of advance he makes, without allowing him to strike a severe blow against his troops. The advanced guards on each road must be checked and drawn into ambuscades, if possible, or attacked on their flanks by light troops moving through the enclosures, who have a secure means of retreat, and know the country well. If the enemy's advance were covered by a veil of cavalry, these might be dealt with by drawing them into ambuscades, by opposing them with infantry and guns, against which they would be helpless in an enclosed country, and by cutting them off with bodies of light cavalry who understood the country and could get about amongst the enclosures.

If the defender's army met the invader close to his point of disembarkation, the advanced cavalry of the latter would be thrown back upon the main body, would impede its advance, and would prove an encumbrance rather than an advantage.

The roads, as we have seen, should be carefully broken up in front of the defender, who would, at points where the enemy had much difficulty in repairing them, oppose his advance, and force him to deploy. The difficulty of marching through the enclosures would cause him to form column on the roads again, as soon as the defender was driven back, and then the defender should immediately make a stand, and force him to deploy again. When he was moving through very closely enclosed country, the defender should force him to advance deployed, and should make him fight his way step by step; in fact, the defender would probably gain by making his enemy move always in order of battle. The infantry of the former should line the hedgerows and make their enemy advance always under fire, fighting themselves under cover, and rarely visible to the latter. They might be divided into two bodies, one of which would occupy a line of fences, whilst the other was preparing a fresh line in rear for occupation, which they would occupy when finished, and be prepared to receive the enemy as soon as the advanced line of infantry was clear of their front. Thus, the second line could always cover the retreat of the first, which might retire round the flanks. These two lines would naturally be composed of troops of the first line, *i.e.*, of the fighting line with its supports and reserves, each half of which would in turn act as the fighting line and the reserve. Behind them again would be the troops of the second line, who might also be usefully employed in assisting to prepare shooting trenches, to make openings in the fences for the retiring troops, and to prepare obstacles. Throughout all these preparations the one dominating idea should be to compel the enemy to fight for every foot of ground; and when he has forced the defender back from one line, and has taken possession of it with troops exhausted by their exertions, and reduced by their losses, to ensure his advance being stopped by another line, equally strong, equally well defended.

In these successive defensive positions all the features of the country will be called into play to increase their strength. Villages, houses, woods, &c., must be prepared for defence, as far as time will admit. Hedges and ditches will fulfil a threefold purpose by acting as shooting trenches, as rallying points for the retiring defenders, and as obstacles to the enemy's advance. It will be the business of the defender, as far as possible, to adapt them to fulfil these purposes by improving the cover they afford, by making a free means of retirement to the defender's troops through them, and by bringing them under the close fire of the next rallying point. It is almost needless to add that it cannot be supposed that the hedges will be universally suitable for fulfilling all or even any of these purposes. Fences will frequently be found in such positions as to give no advantage to the defenders, or, again, it will be necessary, in order to preserve a general alignment, that parts of the defender's line should extend across the open fields, in

which case the spade must be used to provide shooting trenches. The majority of the fences, however, may be expected to favour the defenders in one of the three above-mentioned points.

The main points of detail to which the defender's attention must be specially directed, are (1) the profile of the shooting trenches, which should, as far as possible, be seen into from the defender's next position, (2) the openings for the retreat of the defender's troops in the fences, which should be commanded by the defender's rifles, or if possible, by his guns in rear, or which should be stopped up by fallen trees or other available means, previously prepared, (3) the strengthening of the fences which bar the enemy's direct advance, and their conversion into effective obstacles, (4) the keeping the flanks as far as possible on main roads.

Each section into which the infantry was broken up, might with advantage have a small reserve to line the fences on the flanks, should the enemy's advance in the next field uncover one of their flanks, or should they have in any other way an opportunity of taking any of his detachments in flank. They should endeavour to resist the advance of his infantry as long as possible, keeping up a continuous fire upon his exposed troops. The infantry would very soon learn to appreciate the cover afforded by the ditches, and would become expert at adapting them rapidly. If trained beforehand to the work they would have a great advantage over the enemy. Perceiving their power of resisting him, their *morale* would not suffer so greatly by a continued retreat, as might otherwise be the case, and they would learn to shoot coolly and to retire with little fear of molestation. Cavalry might be employed in small bodies to act when opportunities should occur, and should occupy any positions which would hide it and favour its action; but it should be understood that in such operations, it would be a great error to expose cavalry to the effective fire of the enemy's rifles, unless it was called upon to accomplish some object proportionate to the sacrifice which would be necessary. The artillery should keep in close proximity to the roads, and in the neighbourhood of the main roads some few guns of position might be usefully employed. Occasionally light guns might adventure amongst the enclosures, taking advantage of their commander's knowledge of the country, and might inflict considerable losses on the enemy. Such batteries would frequently be able to find concealed positions from which they could pick off any columns or groups of the enemy within range. In this way the invader's advance would be checked, and his troops would suffer severely, and would, without suffering any absolute reverse, nevertheless lose daily some of their moral power, till at length they became incapable of offensive operations.

Whilst the defender was resisting in front the advance of the enemy, he might undertake offensive operations on a small scale against his flanks and rear. Troops detailed for this purpose should be careful not to be drawn into a serious engagement, but to withdraw when their immediate object was attained. Their duties would render mobility of primary importance. Cavalry would not be

suitable for these duties, since they could very easily be held in check by infantry, and would have very few opportunities of acting with effect. Infantry would not possess mobility enough to act against the rear of an army in motion. It is impossible to avoid the conclusion that a body of troops, such as suggested by the author of "The "Operations of War," consisting of highly trained regiments of mounted rifles, combining the mobility of cavalry, with the fighting power of good infantry, would be unrivalled for such purposes. If opposed to cavalry in an enclosed country, the latter would be destroyed by their rifle-fire; if confronted by infantry, their mobility would enable them to out-manœuvre the latter, and would render them safe from overwhelming numbers. Not only would they be invaluable for the carrying out of offensive operations against the invader's flanks and rear, for destroying and disabling his transport carriages, and for breaking the roads; but their value in all other spheres of action would be great. They would replace the cavalry of the advance, and the enemy's cavalry would be quite unable to contend with them; and on the field of battle they could render many useful services, making sudden attacks on the exposed flanks of the enemy, lining fences at right angles to his alignment, and enfilading his lines. Knowing the country, and possessed of the greatest mobility, they would be in no danger of being cut off, and might remain till the last moment. In fine, for such a force there is a most important sphere of action in enclosed country, and probably the only drawback to its employment would be the limit which economy would place to its strength.

As we have seen, in discussing the defender's strategy, he will stand to fight or not in open country, according to his relative actual and moral strength. He will remember that, the farther he retires, the farther will he eventually have to drive the enemy back, and so the greater will be his loss in offensive tactical action. But, whatever his decision then, the time must come, when, as in strategy, he takes the initiative, so in tactics he must assume the offensive. The resisting stage must necessarily be only a temporary stage, and it is the lesser part of a defender's task. It cannot be too often repeated that passive resistance in war is an absurdity, if always adopted, that its use is to wear out the assailant's offensive power, to allow time to bring up reserves, &c., but that it must always give place to the counter-attack, if the defender is to be successful. An army incapable of taking the offensive is incapable of success. It may repulse an attack; it can never gain a victory. This does not, of course, imply that it is necessary for the *quondam* defender to hammer away at the invader in the same way that the latter has been supposed to have done to him. His retirement may be brought about by other strategical means; but his army can never be defeated, its embarkation prevented, nor can it be seriously molested unless it is attacked and defeated in the field.

To carry out such a system of tactics as here suggested an army must necessarily be not only very mobile, but also very highly trained. The continued retirement, the constant fighting, the daily watchfulness,

all imply high training and the best *morale*. Each small body will have to fight its own battles, at the same time co-operating intelligently with the detachments on its flanks. The many advantages to its resisting action which the enclosed country affords can only be taken advantage of, if the force is trained beforehand to appreciate and to make the most of them, so that from the first moment of its being in contact with the enemy, it may, in this respect, have over him a moral as well as a material advantage derived from the nature of the country, and from its intelligent appreciation of the peculiar features thereof.

But even more important, beause of universal application, than any attempt to suggest the strategy and tactics of an army operating against an invader, which the circumstances of the moment may render it impossible to carry out, are the many lessons which seem to follow clearly from the consideration of this subject. Among these, the following appear to be especially deserving of notice :—

1. There is nothing in the nature of the country which, as is sometimes vaguely assumed, would of itself bring defeat and ruin upon an invading army. True, there are features which might prove powerful auxiliaries, but—only to a powerful defender—only to a vigorous and well-conducted defence. It must be observed, too, that when the defender assumes the offensive, which eventually he must do, these features will be all in favour of the enemy, though it is to be hoped that the latter will not be so well able to take advantage of them. It has been shown, also, how the invader might make use of the defensive power of enclosed country to manœuvre the defender out of his strong positions. In fact, the features of the country will, without doubt, prove advantageous to that side which best knows how to profit by them. But of whatever nature the advantages they confer may be, it must be steadily borne in mind that they are but negative, and from them only negative results can be hoped for.

2. It seems necessary to devote more than a passing word to the consideration of the growing importance of the position of the subordinate leaders in modern war in general, and in war in enclosed country in particular. The last great step in tactical progress was the developing of the intelligence of the rank and file in what is called the "individual order" of attack. Perhaps the next will be the more scientific handling of detachments in action. The great increase in the extent and depth of front of modern armies, added to the difficulty of handling troops in action, makes it impossible that the supreme commander, even with the aid of the field telegraph, can do more than exercise a general supervision over the course of an action; but the carrying out of each specific object must be entrusted entirely to the subordinate commanders in each locality. The great successes of the Germans in 1870 seem to demonstrate clearly enough that modern battles are not won by one great commander, so much as by many intelligent subordinates.

The term "subordinate leader" is one of which a very exact definition is not easy to give. It may be described generally as the man in command of a body of troops charged with the carry-

ing out of some local specific object. In his famous work on infantry tactics, Von Scherf remarks:—"It is difficult to assign "to several battalions the same object of attack—house, village, "wood, &c. In general, it is to one, and only one, battalion that the "duty of attacking and carrying a definite point can be entrusted." Similarly on the defensive it may be assumed that the defence of each point will be entrusted to some comparatively small body of men. Thus, in such a case, the battalion leader becomes the subordinate commander. But we need not restrict the term within any such narrow limits. The subordinate leader may command a brigade; he may have but a score of men under him. Sometimes he may command troops of all arms; sometimes one arm alone.

The importance of his duties may be best estimated by considering some of the many difficulties attending their intelligent discharge. He will have to carry out the wishes of the supreme commander intelligently and accurately. A very slight knowledge of human nature, without the teaching of experience, will show clearly that this is far from being the simple matter it may seem. The difficulty of the accurate understanding of their substance and spirit has ever been a great hindrance in the carrying out of the orders given to each body of troops before going into action, and this difficulty is more noticeable in proportion to the number of heads they have been filtered through. In modern tactics, an error once made can rarely be corrected.

But the understanding of the wishes of a commander is but one step towards the carrying out of the same. The actual and natural inclination of each commander is to regard the action of his detachment as of supreme importance; to engage and defeat the enemy in his immediate front; to perform, if possible, some brilliant feat out of his own brain, and to gain the greatest credit for himself and his detachment. In such a course of action he may be conforming to the views of the supreme commander; he may, on the other hand, be acting in direct opposition to them.

In the carrying out of the part of the general plan confided to him he will be left, as a rule, entirely to himself. Necessity may require occasionally that orders be sent to a commander in action, or the commander may ask for instructions; but to attempt to interfere with troops once committed to action, to alter their instructions, except under the most urgent necessity, would be a dangerous, perhaps a fatal course. Therefore the local commander, after he has once received his instructions, must proceed to carry them out entirely by himself.

A subordinate commander's very knowledge, too, may prove an obstacle to the success of the general plan. He may see, or may think he sees, that the plan confided to him is not the best possible, and he may therefore set about to modify it according to his own ideas. If such thoughts influence the commanders of different detachments, we should find them all working out their own ideas in different ways, wasting some of their energies in pulling against each other, and thus their action would not be co-operative, and the united force of the aggregate of units of which the army was made up, would not be spent in combating the enemy and in carrying out the general plan.

During the course of an action the subordinate leaders will have to watch the action of the detachments on their flanks, and to see that they are co-operating with them in carrying out their plans. It may be desirable for a commander to give up the object confided to him in order to assist a neighbouring detachment in carrying out some other object which is more essential to the success of the whole operation. Again, during the course of an action, many circumstances may occur to interfere with the carrying out of the plan confided to a commander according to his orders, or according to his preconceived ideas. If attacking a post, he may have to meet counter-attack in front or flank; if defending a post, he may be attacked from more than one point or in an unexpected way, or he may have passing opportunities of making counter-attacks. If attacking, he may, after occupying the point where his offensive action is to terminate, find on reaching it, circumstances which may make it necessary to violate the letter in order to carry out the spirit of his instructions. In short, he will be at all points called upon to face the unforeseen.

Such are but a few of the thousand and one difficulties with which the subordinate leader will find himself beset in carrying out military operations at the present day. He will have no power to seek for instructions from those in authority. Time, that most important factor in all military operations, will render it imperative that he should decide upon his course of action at once.

How to remove, or, at any rate, to minimize the effect of all these difficulties is perhaps one of the most difficult questions of modern war. It would be vain to ignore them, and to overlook the obvious deduction that more scientific leading is a necessary consequence of the development of individual intelligence. To stand in the way of progress is a fatal course; to anticipate it, the only safe one.

The tactical modifications, which seem to be foreshadowed by the above considerations, point in the direction of increased independence in the subordinate leaders, and, possibly, to a certain decentralization of authority. What the supreme commander cannot now do by himself, he must delegate authority to the subordinate commanders to do. The latter must be made acquainted with the general plan and with the part to be played by their own detachments. Their instructions must be clear and concise, and they must learn to gauge accurately the mind of their commander. They must learn to cultivate that highest form of discipline, the placing of patriotism before self-interest, the success of the general plan before the glorification of themselves and their detachments; in a word, they must learn the abnegation of self. Thus they will be ready to carry out with all their power, not what may seem to be best, but the will of the supreme commander.

Enterprise should be permitted, and even encouraged, but it must be hedged about with certain safeguards. Thus everything in the way of enterprise undertaken by a subordinate commander should have the object not only of benefiting his side indirectly through its action on the *morale* of the detachment, but also directly through its influence on the general plan. On this point the words of Von Scherf are de-

serving of attention: "One of our latest war experiences," he says, "is that blind *élan* will not do much, if we do not allow it to impose "upon us. Calculated energy, the result of sound instruction, will "amply replace qualities founded, perhaps, on the foolhardiness gene- "rated by hot blood."

3. The consideration of this subject would be incomplete without some remarks upon the influence it should have upon the training of our Auxiliary Forces. These forces, more especially the Volunteer Force, have suffered much on account of the vagueness and uncertainty which have always surrounded the question of their employment in a campaign. Upon the creation of the Volunteer Force, it was generally assumed that it would be employed in the shape of a body of irregulars who were to line the hedgerows, to be concealed behind every obstacle, and to annihilate the bewildered foe. This supposition received a serious blow after the Franco-German War, when the franc-tireurs were found to be so powerless against the German trained soldiers, and it was then perceived that it had been founded upon an entirely false conception of the *raison d'être*, and of the employment of an irregular force. But no sooner was it demolished than its place was usurped by a second. Some hasty thinkers drew from this war (Franco-German) the conclusion that the modern breech-loader was a great leveller of all traditions; that it put the recruit and the trained soldier upon a footing of complete equality, and that a very elementary instruction in its use was sufficient to make 100,000 men, taken from the factories and the workshops, equal to the finest troops in the world. It is only now that the world in general is beginning to perceive that such a theory is tenable on no possible grounds, and that it is contradicted alike by reason, by analogy, and by experience. By reason, because the enormous development of fire power demonstrates clearly the advantages depending upon the relative position of the fronts of forces in action, and because the deep and extended fronts of modern tactics can only be worked with the aid of the most careful training; by analogy, because we know that the difference between a bad and a good workman becomes all the more apparent as the quality of their tools is improved; by experience, because the wars waged since the general introduction of the breech-loader have shown distinctly the helplessness of untrained against well trained troops. It is true enough that intrenchments may help half-trained troops to repulse the attack of the best soldiers, if they attack directly, but it is as well to remember that the former must during the course of a campaign get into and out of their intrenchments, and unless they can do so by some hitherto undiscovered means, they must be prepared to be attacked in the open. Moreover, the knowledge that they were unable to act offensively, or to resist an attack in the open, would confer upon their opponent an absolute freedom in his manœuvres.

These facts, however, need by no means discourage the Auxiliary Forces. Rather they should act as an incentive to urge them forward in the right path of progress, when they have found it. A force like the Volunteers, which has survived the sneers of some and the senseless flattery of others, which has made such rapid and such marvellous

strides towards efficiency, and which has seized so eagerly all the opportunities of instruction which have been afforded it, can only want guidance and encouragement to render itself fitted for the part it would have to play in war; and there can be no reason why this part should be a subordinate one. Its aim should be to make its battalions capable of taking the field, and of acting the same part, in the same way, as regular soldiers. It may be objected that the absence of discipline and of an acquaintance with all the routine duties of a soldier's life will always prevent a force organized as it is from reaching the highest standard of training; and that, therefore, a paradox is involved in the assumption that it could be trained to act in the same way as regular troops. But it may be retorted that every military system in Europe is replete with such paradoxes. The modern soldier has to be trained in a way never dreamt of fifty years ago, and to be disciplined far more severely than his predecessor; and yet this is to be completed during the time that the latter would be called a recruit. In all military systems it is impossible to find all the conditions favourable.

On the other hand, there is much to show that the Volunteer Force, if it had opportunities, is capable of reaching a very high standard of training. It represents the pick of what is obtained on the Continent by the system of universal service, the activity, the intelligence, and the high spirit of the nation. Its distinguishing qualities are intelligence and zeal, two of the most essential in the creation of a modern soldier. Its rapid improvement is a guarantee of the further progress it can make, for, otherwise, where is the limit to its advance to be placed? The exceptional excellence of some of its regiments shows what might be accomplished by the whole force. Association with regular regiments, and manœuvring on a large scale with the other arms, develop its powers of progression in a way so marked and rapid that few, who have not seen the effect of a few days in a large camp upon Volunteer battalions, would believe it. Thus experience, as well as argument, show that, if afforded opportunities, the Volunteer Force is capable of attaining a really high standard of training. It may be noted that a high standard of training would of itself create a form of discipline which a very few days' campaigning would perfect, and that a high standard once reached, would be comparatively easy to maintain. The points to which its attention should be specially directed are: the paramount necessity for devoting all available time to modern tactical formations; the advantage to be derived from manœuvring in large bodies with other troops; the power of working across country, of improvising and improving shooting trenches, of creating and destroying obstacles, and of co-operating with other detachments; and, lastly, the training of its Officers. It must be remembered that the peculiarities of their training and discipline render it above all things necessary that the Volunteers should be well officered. The yearly association of Volunteer battalions with regular troops, in manœuvres or large camps, would test the progress of the different battalions. It is a matter for regret that the expense incident on manœuvres in enclosed country would seem to be so great as to render such practice impossible; for without practical training in the advan-

tages of enclosed country, and the way to utilize them, a defending army would have, in this respect, no advantage over an invader.

If the Volunteer battalions should eventually become sufficiently trained to take their place in the first line alongside of the troops of the regular Army, we should have solved, in the most happy way, one of the most difficult military problems of the present generation; and should have discovered, what we have so long sought in vain, the secret of making ourselves secure without sacrificing our freedom.

Of the other branches of the auxiliary forces much the same may be said. It is right that we should bear in mind, however, that at the present day, the training of troops comprises not only all that is included under the heading of drill, but also the tactical manœuvres of two opposing forces, where the three arms are represented, and where the actual part to be played on the battle-field is rehearsed in the closest possible way. The training of no troops can be considered complete, as is now generally acknowledged on the Continent, who have not been thus periodically exercised.

To the Yeomanry force, it would be difficult to assign any specific part in the defence of the country. It is occasionally remarked that such troops would be invaluable for purposes of reconnaissance. This idea seems to be founded on a misconception, for it can hardly be maintained that troops, trained for such a limited period, can be fitted for what may fairly be termed the very highest duties of modern war. It would probably be more accurate to say that they contain the very best material to make intelligent cavalry soldiers. If this force could be trained to combine the qualities of cross-country riding, which they already possess, with those of good riflemen, they might come to play a most conspicuous part in the question of national defence.

Finally, it may be noticed that the knowledge that they were to take an active part with the regular forces in the defence of the country would act as a most powerful stimulus to promote the efficiency of the auxiliary forces.

4. The consideration of the part to be played by auxiliaries in war leads up to the conclusion that the advance of military science has taken something from the value of irregular troops in war, and that such troops are out of place in a civilized country. The value of an irregular is due to his being able, in some way or other, through national peculiarities, by reason of the nature of the theatre of war, or from some other cause, to escape the direct application of some of the great principles of war. Thus in a mountainous country an irregular will move over ground inaccessible to regular infantry, carrying little but a rifle and ammunition. He will have no communications, and he will derive his supplies of ammunition from some hidden stores, or by occasional visits to the regular troops in connection with whom he may be acting. He will require little food, and will obtain it in ways known only to himself without any direct means of supply. Similarly he will act in an enclosed or a forest country, living and fighting in a way which would be impossible to any but a savage. It is evident that such a creature is an exotic which would rapidly fade in a civilized

country, or in a war engaged under civilized conditions. The African troops employed by the French in the war of 1870 demonstrated very conclusively that the savage is only terrible when his surroundings are savage, and that a black face and a savage expression avail little against good troops in a civilized country. The farther a nation is advanced in civilization, the more closely applicable to it are the principles of strategy and tactics, and therefore the less able is it to employ a body of men who can act in defiance of these principles. On the other hand, these principles are not so closely applicable to nations very backward in civilization. Perhaps it is as well to remember this fact, lest experience of wars with uncivilized races should lead us to condemn or ignore theories deduced from the actual experience of modern war and generally accepted by civilized nations.

5. Another conclusion brought prominently forward by this subject, is that, as a rule, all tactical obstacles in a theatre of war are directly in favour of the most mobile and best trained troops. To this rule there may be found some modifications, as, when the nature of the country calls into play some peculiar national qualities, the advantage is not necessarily on the side of the best trained army. It is to be feared that this modification will not benefit us in a war in the United Kingdom, for it can hardly be seriously contended that our troops have any national aptitude for fighting behind hedges. A skilful leader, again, may derive some advantage from tactical obstacles by clearing ground for the action of his troops, and forcing his opponent to encounter the obstacles in advancing to attack him. This, however, does not affect the general truth of the proposition, for to assume the offensive, the former must leave his cleared ground, and attack his enemy among the obstacles. When such is the case, the advantage of the more skilled troops has been demonstrated clearly enough in the consideration of the attack and defence in enclosed country. The same conclusion appears to be applicable also with regard to strategical obstacles, with this difference, that such obstacles favour the most skilled commander, and the most mobile army. If the truth of this proposition is not apparent from the discussion of strategy in England, we need only glance at the campaigns of the great Napoleon, to learn how an obstacle was always an advantage to him, and a point of weakness to his foes. But it is evident that, to profit by the skill of the commander, an army must be possessed of mobility, otherwise its chance of out-manœuvring the enemy will be small.

6. The last conclusion brought before us is, that the wonderful advance in the application of science to instruments of war betokens the necessity for a corresponding advance in the training and the handling of armies. It is a remarkable fact that, during the present century, the progress made in weapons of war has been most marvellous, whilst the progress in tactical training has been, by comparison, trifling. The balance between these two factors in the efficiency of armies has been entirely upset. It perhaps would not be very difficult to predict that the nation which first learns to restore the relationship between the efficiency of the *personnel* of an army to that of its *matériel* will be, for the time, invincible. It may be argued, that there are limits to hte

improvement of which the *personnel* of an army is capable, whilst we can see no limits to the advances of science in perfecting the *matériel*. True as this may be, it is an argument which has no force till these limits are reached. At the present time, we are far enough from such a point of perfection. The physical qualities of the soldier may not be capable of very great development; at any rate, they are capable of some. Armies may be rendered more mobile. This is a point of very great importance. But in other ways there is ample room for the improvement of the efficiency of the soldier. The consideration of the many points connected with the attack and defence of positions, showing the paramount importance of intelligence and fire discipline in the rank and file of tactical skill, of ability, and of readiness of resource in the subordinate leaders, and of the highest qualities in the commanders, gives us but a very small conception of what remains to be done before the limits of perfection can be reached. The present conditions of the military service of all the armies of the Great Powers render it improbable that the present generation will witness any great advance; for the enormous armies maintained by all nations can only be kept up by a system of short service, which, invaluable as it is for purposes of organization, is yet fatal to the full development of all these qualities in the rank and file.

The question of organization has not been entered into here, as being beyond the limits of this subject. In discussing the strategy and tactics of an army acting on the defensive in this country, the existence and organization of the army has been assumed, and by assuming this, we have rendered ourselves liable to the accusation of having begged the whole question; for, in truth, it would be difficult to deny that organization, by which is implied the accurate fitting together of all the parts of the military machine, and which is in effect neither more nor less than the embodiment of the principle of economy, as applied to military matters, is the very root of all national defence, and the corner-stone upon which alone all progress in training and in tactical skill must rest.

It has been noticed before that, in case of having to give up territory to an invader, it would be useless to attempt a general destruction of such property as could not be removed. In this country we could never imitate the example of the Russians in 1812, who devastated their own country and burnt their capital, in order to prevent the invader enjoying the fruits of his conquest. It is a matter also for regret that such displays of patriotism by our fellow-countrymen, as are related by Macaulay and by Scott, of different periods in our history, when invasion seemed imminent, can never recur, at any rate in the same form. Modern war does not permit of them. Its distinguishing features, the suddenness of its origin, the swiftness of its accomplishment, the decisiveness of its results, all contribute to make it impossible that anyone can take a useful part in it who has not been previously trained, and who has not a clearly defined place to step into at a moment's notice.

Are we to conclude, then, that there is at the present day no opening for the display of patriotism and public spirit by the people of this country? Surely not; modern war has only brought about this

difference, that the time for such displays is now not during war, but during peace. In the place of the excitement generated by the presence of some great national crisis, the propelling motives must in future be prudence, forethought, and a more far-seeing patriotism. It should never be forgotten that, although we live in a free country, where enforced service is not known, yet none the less there rests upon all citizens a moral obligation to assist in the defence of the commonwealth. A large body of our countrymen have acknowledged this obligation by gratuitously offering their services to the State. It is plainly the duty of all who are able to do so to join this band, and, having joined it, to spare no pains to make themselves not only nominally, but really, efficient soldiers. Those who from various reasons are unable to give their personal service can at least aid by showing at all times a lively interest in the question of national defence; for the timely attention of the country to this subject and the due appreciation of its importance are the surest guarantees for the efficiency of our forces and the security of our land.

ESSAY HONOURABLY MENTIONED.[1]

"MILITARY OPERATIONS IN THE UNITED KINGDOM "CONSIDERED, PARTICULARLY AS INFLUENCED BY "THE ENCLOSED NATURE OF THE COUNTRY."

By Captain FREDERICK F. CUTLER, Dorset Militia (late 1st W. I. Regiment).

"Pro aris et focis."

IT seems proper, in a discussion as to military operations in our country, to describe, in the first place, its character and capabilities from a military point of view. We shall see, then, that it is not a country of great natural features, nor, therefore, does it present great obstacles, such as wide and rapid rivers, forests, or chains of mountains; but, on the other hand, the ground is almost everywhere marked by minor "accidents" (to use a convenient Gallicism) which cannot be disregarded by a tactician. Again, it is a country thickly peopled, with many towns of all sizes, and many hamlets and buildings standing alone, and, as a consequence, it has in abundance most kinds of resources that are needed for military operations, and abundant means of communication, more especially by railroad, though it does not certainly possess the great roads found in some parts of the Continent. In these respects, however, it is not unlike countries in which armies have operated in our own day, and often in other times.

But there is one important difference between England and other countries. There are no doubt parts of the Continent in which enclosures are common, as, for instance, some Departments of France, but those parts have not, at least of late years, been the theatre of war. There are also, no doubt, districts in England not much enclosed, but those districts would not, probably, form a part, or at least a large part, of the theatre of war in an invasion. It is, therefore, not unlikely that the lessons taught in former campaigns as to tactics, and also, of course, as to organization, may need to be modified in their application to our island.

In the first place, I propose to consider the three arms separately as acting under these conditions, then to treat of a combined force, and, after examining some special questions, to draw lastly such general inferences as may seem admissible with regard to the probable operations of an invasion, our means and chances of defence, and the composition of armies suited to a campaign in England.

[1] The other Essay honourably mentioned was by Captain J. D. Legard, R.A.

Action of Infantry.

It was commonly assumed, not very long ago, at least by public speakers and writers in the newspapers, that our country was peculiarly favourable to infantry acting on the defensive. This opinion seems to me ill-founded. It is held everywhere in the present day that the best protection of a force on the defensive is its own fire, and it is clear that its fire will be more deadly in an open than in an enclosed and broken country. If this be so, it would seem that in England an attacking force will act under more favourable conditions than on most European battle-fields, at any rate as regards infantry, unless their opponents have had time to prepare their position for defence. To obtain slight cover, or to form abattis and entanglements, would be easy in our country; but these advantages would be poor compensation for the loss of a wide range for fire, which could only be obtained by more elaborate preparation. The frequent necessity of preparing positions to obtain the full effect of modern fire renders it peculiarly important for infantry acting in this country to have a ready and sufficient supply of intrenching tools, and it is worthy of careful consideration, whether great part of these could not be carried with advantage by the men themselves. (1)[1]

If the attacking force will be able to approach the position of the defenders with less loss, it follows that greater breadth in proportion to their depth may be given to the formations for attack than in other countries, or, in other words, the supports may bear a less proportion to the shooting line. In this manner troops might be spared for flank movements which would be favoured by the enclosures, inequalities of ground, and other cover, and powerfully aid the successful development of attacks.

As to the defenders, they would generally find plenty of cover for supports and reserves. But it might be often better for them, when the enemy was only exposed during his advance for a comparatively short time, at all events to aimed fire, to bring from the first as many rifles as possible into the shooting line, using the troops that were left, only as reserves to retake lost positions, rally retiring bodies, or occupy a fresh line of defence, or holding part of them in hand for a counter-attack. To compensate, as far as possible, by the heaviness of his fire for the drawbacks to its effect, the defender might, when the ground allowed, make use of two or more shooting lines, as was often done in the Russo-Turkish War. The same circumstances that would favour the attack of infantry would of course favour a counter-attack made on a repulsed enemy; but in respect to this, it is to be remarked that the ground would probably afford many rallying points and much cover from fire to retiring troops; in fact, if sudden and heavy losses were less common in English battles than they have been in those fought of late years on the Continent, the struggle would in all likelihood be longer and more obstinate.

Of the infantry of the defensive, I may say that, like the assailants, they would probably retire, if beaten, with less loss and disorder than

[1] See Appendix.—Ed.

would be the case on more open ground; that they would have more opportunities of taking up a second position and better chances of retaking a lost position than in other countries; and that they would generally have little difficulty in finding cover for any troops that they might think fit to keep out of their shooting line, whether for supports or reserves, or for some special purposes of counter-attack. However, after weighing advantages and disadvantages, I venture to think, as I said before, that, as cover from fire is the great *desideratum* for an attack in these times, England is a country especially favourable to infantry acting on the offensive.

Two questions have been much discussed of late years in our Service, and also in the armies of other nations. The advantages of large and small companies, and the usefulness of long-range fire.

We have kept our organization of small companies in preference to that of fewer and stronger companies, which has been adopted by almost all other States. It is not the business of this essay to weigh the merits of the two systems as regards their operation in general, but it is admissible to point out that the former seems the more natural in a broken and enclosed country like our own, and that the front of a company of eighty or a hundred files, extended in the shooting line, would be often broken up by accidents of the ground, where two companies of forty or fifty files would be able to act, each under the eye of its own Captain. We might also expect small struggles for localities and dashes to seize points of vantage to be common occurrences in an English battle, and in these cases a large number of small tactical units would have the advantage over a smaller number of large units.

The usefulness of the long-range fire of large masses of infantry, under certain conditions, seems now to be generally allowed in the armies of the great Continental Powers, if not in our own. There might, perhaps, arise circumstances in an English campaign in which it would be particularly appropriate; as it might be impossible to use aimed fire, even at short ranges, owing to the abundant cover from view in a much enclosed country, besides the many slight undulations which would frequently hinder direct fire except at very close quarters. Moreover, troops imperfectly trained in the use of the rifle, would, in such a contest, be more on an equality with a better trained enemy.[1] It may be further argued that, as the supply of ammunition would be a matter of much less difficulty to ourselves than to the invader, it would be to our interest to take advantage of this circumstance, and, if possible, to engage him in a kind of contest which involves the greatest expenditure of cartridges. (2) However, in England, as well as in other countries, long-range fire would seem not the rule, but the exception; or, at all events, it is unlikely that a battle would ever be decided by it against good troops properly handled.

A third question may, perhaps, deserve a short notice, though of less importance than the other two:—that of the usefulness of repeat-

[1] This remark applies, at present, to our infantry militia.

ing rifles. It is worth considering whether such an arm would not have special advantages in a country where hostile forces might often advance, covered from aimed fire, till within a very short distance from each other, probably, in some instances, with one party at least ignorant of the nearness of their enemy. However, this subject of repeating rifles is still more worthy of attention with reference to the armament of cavalry.[1]

In England, hand-to-hand combats being rather more likely to occur than they now are in most other countries, it would appear judicious that all infantry acting in it should have a good bayonet, and understand its use, if only to give them confidence. For this reason I should deprecate the proposals that have been made to combine in one an intrenching tool with the bayonet. I am deeply impressed with the importance of tools, especially in our country, and with the desirability of their being carried, if possible, by the soldier himself; but no such combination can be satisfactory until there is produced a bayonet which would both give confidence to its bearer as a weapon, and be convenient and efficient as a tool.

Action of Cavalry.

The part which cavalry will have to play in the battles of the future has been one of the most common topics of military discussion in these days. It is happily not necessary in this essay to lay down the limits to which modern improvements in firearms may probably restrict it. In this country, even in former times, its opportunities of action in general engagements would have been comparatively rare, chiefly through the frequency of enclosures.

Von Moltke has foretold that the cavalry of an army on the defensive would in future have many chances of action in small bodies against the extended infantry of the assailant, and one or two cases in point may, I believe, be cited from the battles before Plevna. (3) In England there would be no lack of concealment in most places for such bodies, but their action would most likely be circumscribed by enclosures; nor do I think the defensive would derive much more advantage in this way from its cavalry in this country than in others.

The charging of wavering or retreating infantry has hitherto been a principal function of cavalry on the field of battle, and, in the present day, though it would almost always involve heavy losses, it is still not impracticable. But in this country there is, as a rule, too little open ground for this or, indeed, for any important tactical action.

The most important duties of cavalry in our day are to reconnoitre the enemy, and to screen the position and movements of the army to which it belongs. Now, these functions are more especially essential in the case of an invading army, and it is satisfactory to observe that

[1] As a substitute for repeating rifles, the Krnka quick-loader, of which a description was given in the "Journal of the United Service Institution," vol. xxiv, No. 106, p. 384, appears very satisfactory, and it might at any moment be fitted to existing rifles, if it were judged advisable to increase the rapidity of fire for an English or any other particular campaign. It may be remarked that the Soper breech-loader almost equals repeating rifles in quickness of fire.

in no other European country would they, on the whole, be more difficult of performance than in our own. There are few parts of England where mounted cavalry could move freely, and, even on the roads, there would be constant danger of ambuscades or other resistance.

In all great armies, the training of cavalry in dismounted fighting, and their armament for that purpose, have received much attention of late years, and in our island its efficiency in this point would be of the greatest moment.

It would further seem desirable that we should have a force of mounted riflemen, trained to fight only on foot, while using their horses as the means of quick transport to any spot where their services might be needed. I may suggest that we have in our present yeomanry cavalry a force which might be easily and advantageously transformed into troops of the nature indicated. It can hardly be denied that the short time at present allowed for their training is wholly inadequate even to the most elementary instruction of a cavalryman, nor is it likely that the force would ever (before being brought into contact with an enemy) be embodied long enough to admit of learning properly their ordinary mounted duties. Certainly in their present state they would give valuable aid in furnishing orderlies, small escorts, and, in their own districts, guides, but they would be equally useful for these purposes if organized in the manner proposed, while short periods of training might suffice to make them, in reality, fairly efficient as a force of the nature just described. Every facility and encouragement should be given to these troops to practise rifle-shooting in the non-training period. As, in by far the greater number of cases, existing ranges would be available, and as the example of the Volunteers shows the popularity of rifle-shooting in all classes, I have no doubt that, with a very trifling expenditure of public money, a fair degree of efficiency in this respect would be reached. With such a body of troops we should hardly feel that deficiency in well-trained cavalry which I fear the Mobilization Scheme at present makes painfully apparent, even without taking into account the numerical weakness of most of our regiments. With such troops to line our enclosures and guard our villages, I cannot but think that the enemy's cavalry would find almost insuperable obstacles to the performance of those functions of which I lately spoke as vital to the success, if not to the safety, of an invading army. (4)

The employment of cavalry and all mounted troops would be favoured by the quantities of forage that could be found almost everywhere, though in this respect an English army ought to have a great advantage over the invader, who would not, perhaps, be able to draw his whole supply from the country.

As in our country, even more than in others, the general duties of cavalry would be of greater importance than its action in pitched battles, the bulk of the force would be best formed of really light troops, that is, of light and lightly equipped men on strong horses.

For the armament of cavalry in all countries the repeating rifle appears to have special claims to attention, seeing that their dismounted

fighting would be chiefly at close quarters, and that their expenditure of ammunition would seldom be great enough to cause difficulty in its supply. In respect to *les armes blanches*, it may be pointed out that the lance would frequently be the best weapon in a country where hostile cavalry might often meet on roads bordered by hedges, in village streets, and in other defiles. This would seem an argument against proposals to imitate the French in their disuse of that weapon.

The mounted rifles should have a musket and bayonet similar and equal to that of ordinary infantry; but seeing that they would be so often employed to hold in check the enemy's cavalry, a repeating rifle would to them be especially useful, as having undoubted advantages in such encounters. For their defence, if suddenly attacked when mounted, they might be furnished with revolvers or sabres if thought necessary.

Action of Artillery.

England cannot on the whole be called a country favourable to artillery. It is true, that the ground is intersected by a network of roads which would facilitate its movements. Forage also, as was observed in the case of cavalry, could be easily procured, though we might hope to render its supply less abundant to the invader. There would be no difficulty, at least to our army, in finding any number of draught horses that might be needed for the transport of heavy ordnance. By this means, and by the help of the great number of roads, guns of position could often be brought into action. A considerable proportion of the Artillery Militia might be trained to this service, and we might thus hope to counterbalance in a measure that weakness in field artillery which would, perhaps, be our chief deficiency, were we called upon to put into the field the large forces that would be needed to repel a serious invasion. (5) A very short examination of our Mobilization Scheme will show the existence and extent of this deficiency. However, to get its full effect from such ordnance, it would be necessary to choose battle-fields that would offer long ranges to artillery, and this consideration will suggest to us the chief disadvantage to which that arm would be subject in our island.

England is not a country of wide, open plains, of long, gradual slopes, or commanding heights, but one intersected by undulations, slight indeed, but generally sufficient to limit greatly the range of a field-piece, and with abundant cover provided by enclosures, coppices, and other obstructions to the view. In our little valleys, and on our plains covered with hedgerows and timber, the old smooth-bore artillery might frequently have been used with effect, but the same cannot be said of pieces that will fire shrapnel up to 3,000 yards, and will sometimes begin their preliminary fire at 4,000, which distances might be exceeded by guns of position. I hold, therefore, that it would not be expedient to attach too large a proportion of heavy guns to an army corps or army, but to make use of our powerful artillery, when we could force the enemy to give us battle on a field of our own choosing. It follows also from this limiting of the range, that an attacking army to whom, more than to the defensive, the preliminary fire of artillery

is a necessity, and who would most likely not find themselves under conditions favourable to its use, would be so far at a disadvantage in this country.

A minor drawback to the utility of artillery would be the frequent opportunities of an attack on it by troops approaching under cover of hollow roads and hedgerows, which would compel the constant use of escorts and supporting bodies. Artillery would be also, to a certain extent, deprived of their freedom of manœuvre by enclosures, and the guns of the defensive would be sometimes exposed to capture, owing to the difficulty of withdrawing them, if fought till the enemy approached to very close quarters.

If it be true that the average distance at which artillery could act in England would be comparatively short, it might be worth while taking the fact into account in providing ammunition for an English campaign. As shrapnel is for most purposes greatly superior to common shell at any but very long ranges, the bulk of the projectiles should, here more especially, be of that nature. I speak of our own forces. The enemy would be obliged to carry a considerable quantity of powerful common shell for the destruction of parapets, as he would naturally expect to be compelled to attack us in fortified positions. Nor could the provision of common shell be altogether neglected by ourselves, as it would be often necessary, when we judged it proper to take the offensive, to shell the enemy out of villages and isolated buildings. A small supply of case shot (which, of course, in case of need, would be supplemented by shrapnel reversed) would be desirable if compelled to act at close quarters, or for defence of the guns if suddenly attacked.

Having regard to the short ranges at which artillery would often be called on to act, I may draw attention to the suggestion lately made by Colonel Brackenbury, that a battery should be accompanied by two wagons laden with light mantlets of steel for the protection of the gunners from musketry. Under ordinary conditions, it is certainly a strong argument against this proposal that the horses for these wagons would be more usefully employed in drawing additional guns, not to mention that the shields would give a very good mark for percussion shells. But when I remember that, in future, artillery will give a good mark for the fire of long bodies of infantry up to 1,500, or even 2,000 yards, and that longer ranges would often be wanting in this country, I cannot but think that, with reference to the present subject, the question is worthy of careful consideration. The same reasoning applies to artificial cover of all kinds, which would be more frequently than elsewhere necessary, or at least highly desirable. This being so, it follows that a stronger case might be made out for the preference for breech-loading artillery over muzzle-loaders than in other countries.

Machine-guns would act under favourable conditions; they are best suited to comparatively short ranges, not exceeding 1,300 or 1,500 yards. They would be especially useful in combination with musketry in the defence of defiles, such as villages, streets, or hollow roads.

The Three Arms in Combination.

It is now proper to view the three arms, of which I have just treated separately, as acting in combination. In the first place it may be asked whether, taking into account the action of all arms, England is a country favourable to the offensive or to the defensive. As regards infantry, I have held the country to favour the offensive.

On the other hand, I pointed out that the effectual preparation of attacks by artillery fire would be generally more difficult than elsewhere, while the defensive might frequently be aided by the support of guns of position. The obstacles generally present to the tactical action of cavalry would, I think, be unfavourable to the defensive, rather than to the offensive, as that arm will, perhaps, in future, be most likely to influence the result of battles by charging the extended infantry of the assailants; especially if wavering under the fire of the defenders. There is no doubt that the ground would favour flank movements of all arms by the quantity of cover generally present. As there is little doubt that, in future, the offensive must in the great majority of cases make a turning movement its chief operation, or at least give in this way powerful support to any front attack, it seems clear that, in the opportunities that this abundant cover would give for the successful carrying out of such movements, the assailant would have a momentous advantage. As some counterpoise to this, the defensive would have similar advantages in the concealed preparation, and in the execution of counter-attacks. In some cases, a considerable force might be suddenly thrown on an exposed flank of the assailant. The closeness of the country would, of course, favour surprises, but these can seldom be effected, except in minor operations, which subject will be considered presently. It is perhaps hardly worth mentioning that the unusual frequency of mist and heavy rain in this country might sometimes favour the offensive. This consideration would be of more weight were it likely that an army would remain in front of its opponent's position for any length of time, but this I venture to think very unlikely, as in an invasion of England (for reasons which I hope presently to make clear), almost everything would depend on time. On the whole, when I consider that infantry fire is the chief feature of modern battles, that on its advantages in this respect the defensive must mainly depend, to counterbalance the superiority in the numbers or quality of the assailant's troops, and that these advantages are much less in England than on the Continent, I cannot but draw the conclusion (subject to an important limitation, which I am about to make), that this is a country favourable to the offensive in tactics.

It is not, however, to be supposed that an English army would be compelled to fight a defensive battle on the soil of its own country without choosing and preparing its position. An army engaged in the defence of a thickly-peopled country ought easily to find any amount of labour that it may need for defensive works. These would consist in England, in great measure, of clearing a field for infantry fire and, in many places, of forming such cover as should

enable our guns to fire at short ranges, with comparatively little loss, on the attacking infantry. After clearing away the obstacles to the full effect of the musketry, the amount of natural cover would usually make it a comparatively easy task to shelter our own troops from the fire of the enemy. In this way such a defensive position might often be created in this country as might defy the attack of a greatly superior force, even if part of the defenders were imperfectly trained troops. The extent and nature of the preparation of our positions would vary greatly with the time available for the purpose. Great advantage would be derived from merely clearing a range for infantry fire. The benefit which, it has been said, would accrue to the assailant from the closeness of the ground would then disappear; but there would remain the disadvantage to which he would be subject by the difficulty, in many cases, of finding positions from which his artillery could prepare his attack while itself beyond the effective range of musketry.

In fact, the ground in such a case, before favourable to the offensive, would have become favourable to the defensive. Had our forces a little more time, the next stage in the progress of the works would be the formation of slight cover, and of abattis and entanglements in suitable places, purposes to which the ground would be usually suitable. (6) Where, however, we could count on several days elapsing before the appearance of the enemy, more elaborate fortification might be undertaken. Redoubts would be constructed, and deep shelter trenches excavated. Bomb-proof and splinter-proof cover would be provided. Emplacements would be formed for guns of position, or, perhaps, for still heavier ordnance; and, as we could thus compensate for our weakness in field batteries, we might fearlessly clear the ground up to the full range of artillery. The Volunteers might safely be employed to compose the bulk of the garrisons in positions of this strength, for the creation of which favourable localities could no doubt be found, either in the environs of London or nearer to the coast. As to the time we should probably have for such works, the question will be better discussed in another part of this essay. For the labour we should not, of course, depend solely on our military forces. Even in the execution of the less elaborate kind of defences, the country people would no doubt give valuable help, particularly in clearing the ground; for the stronger positions last described, civilian labour would be transported to the spot, if not, as in the neighbourhood of London, already available there in any quantity that might be needed.

For such purposes, however, it is necessary that our forces should comprise a large proportion of engineers, a body whose services would be of the greatest utility in a country where, in most parts, there exists a number of small obstacles, of which the importance could be greatly increased by art. Our strength in this respect has been lately raised by the institution of Militia Engineers, but it is worth consideration whether the nation could not afford to create fresh corps in the great centres of population and manufactures, rather than to diminish an infantry already not too numerous, by the conversion of existing regiments.

To return from the subject of specially prepared battle-fields, it will, I fear, be impossible to avoid the repetition of some former remarks in describing the probable character of a general engagement in England under *ordinary* conditions. Although a front attack may more frequently and rapidly than elsewhere succeed in penetrating an enemy's position, the success thus obtained will be proportionately less decisive. Often the points carried may not suffice to determine a general retirement of the line, and may be re-taken by a vigorous assault of reserves, favoured by like conditions to those that led to the success of the original assailant. Even if the enemy's line be forced to retire along its whole length, it would often find a sufficient number of rallying points to enable it, aided by its reserves, to renew the combat in a second position. Should the assailant fail, a counter-attack would be favoured by the circumstances and its success subject to the limitations of which I have just spoken with regard to the original attack. The assailant, while probably escaping the sudden and tremendous losses that fell on the Germans and Russians on the open slopes of St. Privat and Plevna, would find his ranks equally thinned by a long and stubborn strife of localities, while the defender, even if successful, could not hope to purchase his victory cheaply. As I have said, it would be very seldom possible to complete the discomfiture of wavering troops by a charge of cavalry: this means of shortening the duration of actions, and therefore the bloodshed, now perhaps more difficult anywhere than formerly, would in England seldom, even in former times, have been available. Again, battles would not be so often decisive in England as elsewhere. It would be less easy to push a beaten enemy by any means, and especially with cavalry and horse artillery, whereby retreat may still sometimes be converted into rout and destruction, as it often has been in the past.

The complicated problems that ground so varied and so much intersected would present, would test most severely the tactical abilities of the General Officers holding independent commands. An eye for ground would be to them, more than elsewhere, an indispensable qualification, while, of course, a Commander-in-Chief, in the selection of the field for a decisive battle, or in his dispositions and plans of attack, would have to weigh the importance of a larger number of circumstances and of more equally balanced advantages and disadvantages than if he had to engage on more open ground and amidst more strongly marked natural features. An innate genius for war, such as a few individuals possess, will no doubt under these conditions have a decided superiority. But as such a genius is uncommon, and can seldom or never, if it exist, be developed without practice and experience, while in its absence its place must be supplied by highly-trained judgment, I cannot but think that public money would be well spent on manœuvres in country as nearly as may be resembling that which would be probably contested in an actual invasion. There can be no doubt that a General Officer would require the fullest information as to the ground on which he would operate, and in this respect the advantage ought to lie on our side, as trustworthy information from the inhabitants would not be so readily obtainable by the enemy,

while a complete reconnaissance would be attended with unusual difficulties.

Coast Defence.

Before going further, it is desirable to turn to a question which is of the greatest importance to our security, viz., that of coast defence. Its importance, indeed, cannot be overrated; for undoubtedly the greatest obstacle in the way of an invasion of these islands would lie in the difficulty of landing in the teeth of the opposition which might everywhere be made by local volunteer corps, and of disembarking a sufficient force and taking up a position to cover the rest of the operation before telegraphs and railways would enable us to concentrate on the threatened point.

It is not, however, necessary or proper to treat this subject at length in an essay of this kind. Some of the means of defence are too obvious to be mentioned, and others are wholly within the province of the engineer. I may, however, remark that the ground on the southern coast, one of our most vulnerable sides, is, in great part, more open than the country in the interior, and proportionately more suited to defensive positions, or more easily adapted to them. At the same time, the downs would often present opportunities for cannonading the enemy while landing, without placing our guns within effective range of the ships covering the disembarkation. Should the enemy take up a position with part of his forces on these downs to protect the landing of the remainder, the ground would probably be less advantageous to him, as the inland slope of the downs is generally more enclosed and more thickly timbered than that towards the sea, and therefore less suitable to defence without long preparation.

Local corps of all arms would be invaluable in coast defence; but two forces I wish to speak of in particular. I have said that coast defence is in great part a question of engineering. Volunteer Engineers are mostly to be found in great cities, and I would rather see Militia Engineer corps raised in these cities than the conversion of existing infantry regiments. But before an invasion became imminent, the militia would doubtless be embodied, and the corps stationed where they were deemed most useful, while detachments of Volunteers would gladly, no doubt, be placed under arms at the first suspicion of danger, and would be posted on the vulnerable parts of the coast. Again, mounted riflemen, by the rapidity with which they could move to a threatened point, would be of the greatest utility in this service of coast defence, dismounted cavalry being less suitable, as not being trained to act chiefly on foot, generally indifferent shots, and not in our Service armed with so effective a rifle as the infantry; and these remarks of course apply in their full force to our present yeomanry of which I have ventured to suggest the conversion. I have spoken of the obstacle to invasion which the extreme difficulty of landing in the face of opposition presents. This opposition need not be made by a numerous force. (7) Small bodies might, at least, delay a landing for a sufficient time to allow of the concentration by our network of

railways, of a large force; and the presence of a local corps of mounted riflemen in each of our southern and eastern counties might prove of the highest importance to our security, by strengthening the force immediately available at any given point.

The Minor Operations of War.

It is also necessary to make a few remarks on the conditions to which the minor operations of war would be subject in this country.

In the disposition of outposts, two objects are sought to be attained:—The concealment of one's own position, and the discovery of an enemy's movements. The first is comparatively easy in an enclosed, wooded, and broken country, the latter proportionately difficult. But, as we, in our own country, could reckon on more information from the inhabitants than an invader, we should be favoured by the closeness of the ground, as our principal requirement would be concealment. The strengthening of an outpost line by abattis, entanglements, and other means would be easy in England. Although, as I have said, such obstacles would not counterbalance, in a serious engagement, the absence of clear ranges for infantry fire, they are especially suitable as protection against sudden attacks, and as means of gaining time, which is, of course, the object of outpost resistance. Buildings would be often found in the outpost line which would be useful in the same manner.

The remark I have just made as to information from the people of the country will apply to reconnaissances made by cavalry or advanced guards as well as to outposts. Such reconnaissances also will be peculiarly necessary to the invader, and in our country peculiarly difficult of execution: where views are circumscribed and cover abundant, they must very often be impossible without the employment of force, and cavalry, on which arm the duty would mainly devolve, would generally be at a decided disadvantage in the employment of force in this country. To keep them at a distance would be a service in which the mounted riflemen, whose formation I have recommended, would probably be generally successful.

From what has gone before, it is not hard to deduce the organization of outposts and advanced guards in England, so far at least as to conclude that the proportion of infantry to cavalry should be greater than elsewhere. From what has been said of artillery also, it may be inferred that its use in these kinds of service would be limited, though it might sometimes be useful to an advanced guard for shelling a defile.

Of rear-guards protecting a retreat it may be affirmed that they would have great opportunities in England. Their function is less often real resistance than to compel the pursuer to deploy his forces, and thus gain time for the retreat of their main bodies. The chief means to this end is concealment of their actual strength, which is easy in an enclosed country. The composition of rear-guards, as of advanced guards, owing to the nature of the country, would require the proportion of infantry to cavalry to be increased; but the employment of artillery is peculiarly suitable to rear-guards (where as in

England plenty of good roads exist for its withdrawal), as giving an idea of a greater strength than is really present, and as compelling the deployment of the enemy before he comes so close to the force as to endanger its retreat. Moreover, as the troops of the pursuer could in our island seldom move rapidly except by the roads, great delay might be occasioned to them whenever a few guns could be brought to bear on the heads of the columns. When the rear-guard found itself obliged for the protection of the main body to allow the pursuer to come to close quarters, machine-guns, the lightness of which makes them very suitable to the use of a force of this kind, might often be employed with great effect.

Of flanking detachments it may be said that it is much more difficult to scour a close than an open country, and the disadvantage of this would full chiefly on the invader, who would be more liable to a flank attack and less able to learn the position and movements of his opponents from the inhabitants. In the performance of this, as of other similar duties, the country would favour infantry rather than cavalry.

Of convoys there is little to say. An English campaign would probably be too short for the enemy to repair the railroads, which would no doubt have been rendered useless in those parts of the country of which he was in possession. Thus he would be compelled to rely on the roads for his communication with his base. There would be many places in England where convoys could be attacked with advantage, but the line of communications would be too short and too easily guarded for such enterprises to have much prospect of success. The enemy could also find, without difficulty, easily defensible *etappen* stations. The attack of convoys has been always a chief object in guerilla warfare, which, however, could not be carried on in England with effect. It is suitable only to mountainous regions, or to great forests, and perhaps to less civilized nations. In the attack and defence of convoys, infantry would be the arm most favoured by the country.

Strategy and Organization. General Features of an English Campaign.

Having discussed the probable modifications of tactics by the nature of our country, we have next to see how those modifications will affect the probable course of an invasion, what means of defence would seem best fitted to the conditions of the case, and what would be the best organization for the forces of either side. After this, it will be possible to make some estimate of our chances of repelling an attack.

It may be assumed that an invasion would be the result of a temporary superiority of the enemy's naval strength in our seas. That we should allow such a superiority to be permanent is not probable; nor, if we did, would it be easy for us to carry on the war even if not invaded. But it is quite conceivable that the attack might be made when the bulk of our Navy was at a distance—a scheme which in 1805 nearly succeeded. For these reasons, it will be assumed throughout this essay that the enemy's possession of the Channel is

but temporary, and that the object of an invader, acting under these conditions, must be to strike such a blow as would induce our Government to conclude peace on terms advantageous to him before we regained our maritime superiority in the British seas. It is reasonable to suppose, in these circumstances, that his objective would be London.

But before trying to find out what plans of campaign the nature of our country and our means of defence would indicate to us, it seems not improper to say a few words about the probable composition of the invading army, as well as about its probable operations. From the causes that have been mentioned in the earlier part of this essay, the enemy would probably not expect so great services from his cavalry as in other countries. This would undoubtedly be no small disadvantage to him, but it would be some compensation that the difficulty of transporting his army by sea would be lessened, in proportion to the diminution of his strength in an arm requiring more ships than an equal number of infantry, and those specially fitted up for the purpose. If, again, England is considered a country somewhat unfavourable to artillery, the reduction of the usual strength in that arm would, so far as it went, diminish the difficulties of sea transport, for the reasons just referred to in the case of cavalry. But it must be remembered that an invader would have to bring batteries of all calibres, including guns of position, for the bombardment of field works, and perhaps even a siege train. Considering the number of good roads in the country, and the likelihood of finding much forage, he would probably think fit, on the whole, not to reduce his artillery to a very small proportion. He would also find that engineers are a force which, as I have said before, would find plenty of employment in this island, and it would be well for him to be in this respect amply provided. Of the total numerical strength of the invading army it is not the province of this essay to speak, but when the whole question of invasion has been discussed, it may be hoped that it will appear that, if our present means of defence are maintained and developed, that army will need to be one of no small proportions. The numbers would probably be limited by the number of ships available for their transport. It must be taken into account that a large quantity of stores would have to accompany the forces. In the first place, I do not believe, for reasons to be mentioned presently, that the enemy could draw all his food and forage from the country. It cannot be disputed that this country is more favourable than most others for the supply of these necessaries; and with respect to forage, which is often a difficulty, especially to invading armies, it is so far favourable to the mounted services. However, some part of these stores would, in all probability, have to be brought from the enemy's own country.

In these days, when battles usually begin with a longer preparatory cannonade than in former times, the bulky ammunition of artillery would have to be carried in large quantities. Still greater is the increase in the amount of small-arm ammunition required as compared with what have would sufficed in the beginning of this century. (8) These facts would limit materially the numbers of the army which

the invader's means of transport would enable him, in the first instance, to place on the shores of England.

The subject of coast defence having already been touched on, the invader may be assumed to have landed his whole army. This brings us to a point at which a peculiarity presents itself in the conditions of an English invasion. In the ordinary case of an invasion crossing a long, open frontier, the initiative gives great, if not permanent, advantages to the invader. He can penetrate to a considerable distance before, in most cases, the power acting on the defensive, which has necessarily been ignorant which of several vulnerable points would be assailed, can concentrate any force capable of materially interfering with his movements. In our case, however, the enemy, being compelled to strike a decisive blow within a short space of time, would be confined to a very few possible lines of advance on the capital. The comparatively short coast line that would have to be taken into account ought to enable us so to dispose our forces as, by the help of our many railways, and considering that some delay in the disembarkation would be practically inevitable, to oppose at once whatever degree of resistance we thought fit to the invader's advance. I am far from supposing that it would be advisable to fight a pitched battle in the neighbourhood of the coast. But, as soon as the enemy began his advance into the interior, he ought to find himself in contact with the outposts of a force sufficient to delay his progress, while preparations were being made further inland for more serious resistance.

The nature of the ground would favour greatly this work of delaying the enemy. In the first place, it would be almost impossible to push forward a chain of cavalry three or four marches in front of the army, as modern strategists prescribe, for the support of infantry would certainly be necessary to them in such country, should they meet with any considerable resistance; nor, indeed, could mounted men sufficiently explore districts so much enclosed. The cavalry, then, being but little in advance of the army, and hampered in its movements, the invader could not move forward securely by long marches, as his information of our position and movements would, in these circumstances, be very incomplete. He would depend for his safety mainly on advanced guards of all arms. (9) These unfavourable conditions under which cavalry would act would be, as I have said before, a disadvantage to the invader, who has special need for its services. In affairs of outposts, generally, the advantage would be with the defenders, the closeness of the country favouring their concealment from the enemy, of whose proximity they would very likely be aware by information from the country people, even if he would otherwise have escaped their observation; moreover, they should be better acquainted with the ground. Their position would be easily secured against sudden attack by abattis, entanglements, and other obstacles, which is as much a *desideratum* for an outpost position as a clear range for fire in a serious engagement.

By these circumstances the operations of the enemy's reconnoitring and foraging parties could be much impeded, and his progress would

be proportionately slow. In this kind of warfare, judgment, presence of mind, and keen perception of the advantages of ground would play a great part, and to carry it on successfully, they would be required in Officers holding the smallest commands. This remark, however, would apply to the enemy as much as to our own Officers.

Mounted riflemen would, I believe, be of great service as supplying our deficiency in cavalry by a force better suited to the country. Moving rapidly from point to point, they ought to be everywhere a thorn in the side of the invader.

The mention lately made of foraging parties leads to another question, bearing on the rapidity of the invader's march, and on his ultimate success—that of supplies from the country. To ourselves it would, no doubt, offer resources in abundance. Nor do I suppose that the enemy would not profit more or less by this abundance. It would probably be impossible to remove or destroy everything that could benefit him; nor is it reasonable to suppose that the most patriotic people would in every case be willing to make the sacrifices that this would necessitate. Moreover, a Government may hesitate to inflict great hardships on its subjects, and thus indirectly to injure the State, so long as it thinks it has good ground for hoping to repel the attack by other and less costly measures. It is, however, fair to presume that the invader could be deprived of many advantages without much loss to our own community, and by actively maintaining the kind of warfare to which I alluded in speaking of outposts, we might, being favoured by the nature of the ground, make his acquisitions of this kind slow and difficult, and often succeed in repelling or even cutting off the detachments entrusted with these duties. For these reasons it seems fair to assume that the enemy would be unable to feed his army, at least for more than a few days, entirely by requisitions, and that he would consequently be forced to bring with him a portion of his supplies, and, if that were exhausted, to introduce fresh stores from his own country.

It need hardly be remarked that the less resources the invader could get out of the country, the more, in other words, he was dependent on his convoys for his supplies, the slower would be his progress towards his objective, and the more time should we have for making our preparations of all kinds.

In fact, everything in this campaign would depend on our gaining time. The enemy would strain every nerve to reach our capital before we could create such a position and make such preparations as would enable us to bar his progress, either in the neighbourhood of London, or even nearer the coast. Should he succeed in reaching London, he might inflict such injuries on us as, even if he failed to constrain us to a peace, would almost repay him for the ultimate loss of his army. Should we, however, bring him to a standstill, or even should we force him to make a wide *détour* in his march towards his objective, his position would become highly critical. It could not be long before we regained our maritime superiority, which I have supposed lost for a time in the British seas; and the enemy could hardly maintain the struggle long after the resumption of our maritime superiority had

severed his communications with his own country, or, in other words, had cut him off from his base of operations. In truth, the approach of our returning fleet would most likely determine him either to a timely withdrawal, or to a desperate attempt to break, at once and at any cost, through whatever barriers we might have interposed between him and his objective. To turn to the movements of the enemy, his columns would probably be covered by strong advanced guards. The Germans, in their invasion of France, generally made use of very large bodies for this purpose. In the case under consideration, it would be imperative on an invader whose object was as great a rapidity of march as possible to employ sufficient forces to sweep from his path any slight opposition without having recourse to the deployment of his main body. What has been before said of flanking detachments will show that his security would also depend on the allotment to this service of considerable numbers. Nor could he dispense with rear-guards of some little strength as, his march being too hasty to allow him to completely secure his line of operations from the first, he would be exposed to the incursions of mounted troops even from this direction. It need not be said that all these detachments would tend to weary and harass, and therefore to weaken, the army that was forced to make them.

Among the first operations of the enemy would be the taking possession of, at least, one suitable harbour to keep up his communications with his own country. It would be desirable that it should admit of being easily protected by intrenchments, and would thus serve not only to give entrance to stores, and possibly to reinforcements, but also to afford a place of safe re-embarkation in case of retreat. From the coast he would establish and protect a line of communications in the usual manner. Although I have expressed the opinion that this is a country favourable, under ordinary conditions, to the offensive in tactics, I do not advocate our attacking the enemy in a pitched battle, at least in an early stage of the campaign. It is, perhaps, hardly necessary to remark that, before he decided on an invasion, he would have assured himself of a superiority in the numbers or in the quality of his troops. This being so, it would be our obvious and necessary policy to endeavour to annul that superiority by receiving battle in a carefully chosen and prepared position. To the creation of such positions I have ventured to think the country is not unfavourable. The arguments in favour of this course would be especially cogent, seeing that a more or less considerable proportion of our available forces would probably be imperfectly trained troops, whose deficiencies would be least apparent in this manner of fighting. It is not of course within the province of this essay to determine at what point it would be advisable to offer the first resistance of this nature. The answer to this question, it may be remarked, would depend on the distance from the capital at which the invader had landed, and on the rapidity of his march. In any case it could not be given without complete local knowledge. It may be assumed that the enemy would throw his army on the coast at no great distance from London, if to the south of the Thames, somewhere between Folkestone and Ports-

mouth, if to the north of that river, somewhere in Essex, as in either case he might advance with little or no inconvenience from permanent fortifications or considerable natural obstacles; whereas should he land at Deal, or in the Isle of Thanet, he would have Dover and Sheerness on his flanks, and in front the Medway with the works now in progress at Chatham. The distance his army corps would have to traverse would in neither of the cases supposed much exceed from 50 to 70 miles by road before they appeared in front of London. If, however, we turned properly to account the advantages that the country would give us in delaying his progress, it is probable that he could not move at a greater average rate than 10 miles a day, considering the difficulty of moving large bodies rapidly for several days together, even if their movement be unopposed. There would, therefore, be sufficient time for making in the neighbourhood of London preparations of considerable magnitude by the help of our great resources in labour, especially as we should probably have been aware of the imminence of invasion for a few days before he actually effected his disembarkation. Should we have a longer warning of the invasion, or his progress from any cause be slower than has just been supposed, we might be able to create such a position between the coast and the capital, were it deemed advisable, as could not be turned without a *détour* that would enable us to make preparations elsewhere for defence, and consume time that would be to him of vital importance. However this might be, it would, I think, be judicious in this part of the campaign to avoid if possible fighting a pitched battle, except when we could force the enemy to attack us in an elaborately prepared position, which would give us favourable chances of victory, and which could be held chiefly by our garrison army. In this manner our field army would be kept nearly intact to manœuvre against the enemy in the most effective manner, and, perhaps, if he should be compelled to retreat, to inflict on him the greatest disasters.

There are some arguments worthy of consideration in favour of allowing the enemy to approach the capital. In the case of London, any quantity of labour that might be needed for the works of defence would be found already on the spot. For this reason, as well as because of its distance from the coast, more effectual preparations would probably be possible in its neighbourhood than in a more advanced position, to which labourers might have to be transported. It would, fortunately, be almost impossible to invest London, so long as our works at Tilbury and elsewhere gave us the command of the Thames, and the contingency of the passage of the river being forced, of course, hardly belongs to the category of military operations. It is presumable that we should have gunboats or other vessels of war on the stream. The great security of an investing force, in the present day, lies in the fact that it has no flanks; but in this case the line would have most vulnerable flanks, where it approached the water. (10)

However, it is not likely that the invader, to whom, for the reasons before mentioned, time would be a vital question, would attempt to make himself master of our positions (wherever we might take them up) by anything like blockade, nor even by a regular siege. The

amount of the security given by field-works against more speedy forms of attack may still be regarded as an open question. It will, however, hardly be denied that the history of the latest great war points to the fact that that security, never small when the works were properly placed and constructed, is, in our days, much increased, an inference which, perhaps, might fairly have been drawn from the modern improvements in firearms and artillery, even if it were not supported by the experience of actual warfare. (11)

It must be admitted that the country could not be effectually cleared over such an extent as to prevent the enemy profiting by its nature, in the concealment and security of his outposts, and in the shelter that the villages and houses would afford to his troops, so long as he remained before our position; but these advantages would be of trifling moment, seeing that he would be compelled to strike his blow without any long delay.

Having discussed the course that the campaign would probably take in its earlier stages, it would seem appropriate, before going further, to state briefly the organization by which we might hope to carry out the plans suggested, and take further measures towards ultimate and complete success. The present Mobilization Scheme will, no doubt, afford guidance in this respect; but it must be remembered that (however great the ability with which it has been worked out) it starts with the necessary assumption that the numbers and disposition of our forces would be much the same as they are while we are not engaged in any great war. It is, however, most likely that great modifications would have taken place in these respects before an invasion became imminent. How far these modifications might be beneficial or the reverse to our chances, it is impossible to say with precision. A greater part than usual of the regular army might very likely be absent on foreign service; but it is possible that its total strength might be so far increased that the present numbers at home would not be lessened. The militia would probably have been embodied since the beginning of the war, and, it may be assumed, would have attained a respectable efficiency as a field force. To supply the bulk of our garrison army we might rely on the Volunteers. It is true that there is no parallel instance in military history to show us what might be expected to be the quality of such troops; but the opinion of competent judges warrants us in confidently expecting that they would, at least, do good service, not only in the garrisons of permanent fortresses, but also in the defence of strongly intrenched positions. Part of the regular army and of the militia would, of course, as laid down in the Mobilization Scheme, be employed in the garrison army; but the bulk of those forces would be free to manœuvre against the enemy's communications, or to act in other ways that might be deemed advisable; but the chief deficiencies would be in cavalry and field artillery. For a long time after the outbreak of war, our weakness in these respects, easily discovered by an inspection of the Mobilization Scheme, would, I fear, be aggravated. Part of the forces of these arms, now at home, would probably have been sent abroad, and it would be impossible, without time, to raise

squadrons and batteries to fill their places. With respect to artillery, I have drawn attention to the possibility of employing, with advantage, guns of position, when an opportunity offered, to which service part of the Artillery Militia might be trained. Moreover, our English *Plevnas* might be armed with heavy guns worked by the Volunteers. As to the other arm, I have ventured to suggest an improvement in the efficiency of the yeomanry, by their conversion into mounted riflemen. However, it is to be feared that these measures, though they might palliate, would not altogether remove the disadvantage, especially as regards artillery. It is fortunate that the country, as I have said, is not favourable to either of these arms, and, indeed, extremely ill-suited to the action of cavalry. (12) Mention has been made elsewhere of the importance of having a large proportion of engineers in an English campaign. Many gaps appear, under this heading, in the Mobilization Scheme. However, the new institution of Engineer Militia is a step towards supplying the deficiency, and we might, also, for some purposes, reckon on the services of Engineer Volunteers. General Brialmont tells us that the Duke of Wellington said an army could not have too many engineers, inasmuch as when not employed in their special duties, they could act as infantry; indeed, they did so act both at Waterloo and at Inkerman. As the employment of large numbers of Volunteers in the defence of our fortresses and intrenched positions would render available, for manœuvring, the greater part of our regular army, and even of our militia, it is next to be considered what direction should be given to their operations. The answer to the question seems easy. They would strike with most effect and with most certainty at the enemy's communications. Though he might guard these, without great difficulty, against enterprises on a small scale, it is most unlikely that he could spare from his main body a force large enough to hold in check the army of which I am speaking. It is probable that all the enemy's available means of maritime transport would have been employed in carrying his army to our shores. Therefore, two or three days must have passed before his ships could have returned to his own ports, and have brought back supplies or reinforcements to his base of operations. To hinder these supplies and reinforcements from reaching the enemy's main body would be the especial duty of our manœuvring army. The difficulty of finding ships enough for the transport of a sufficiently large army and sufficient stores would be one great obstacle to an invasion of England. I have said that it was not probable that an invader could feed a great army, at least for more than a few days, altogether on provisions obtained in the country. I have also, before, pointed out that the supplies of ammunition required are very large in these days, particularly for small arms. It is very unlikely that the enemy would be able to carry over, at first, a supply either of provisions or of ammunition large enough to last long without renewal, nor, if he were able, would he care to encumber the march of his army with trains of enormous length, when everything depended on dispatch. If, then, he were cut off from his supplies, he might be forced to retreat, even before the

return of our fleet threatened to sever him finally from his own country. A scarcity of ammunition would not only hamper his operations, but even endanger his security. In fact, the mere imminence of a scarcity would probably be followed by his retreat, as, in such a case, even success in action would leave his army helpless.

Our Field Army, also, would be probably strong enough to stop the march of any reinforcements to the enemy. It is scarcely worth while to say that, should he receive reinforcements, not only would his chance of success be increased, but we should probably lose any chance we might have had of routing or destroying his army, if it were compelled to retreat, the more so as the reinforcements would be fresh troops, and not so disheartened as the original force would be if retiring after a failure. (13)

I have tried to show what chances we have of successfully repelling an attack on our capital. Should the attack succeed, and our Government still be resolved on carrying on the struggle, there is no doubt that the enemy, cut off from his resources when we had regained our naval ascendency, would ultimately have to succumb, but our triumph would, in this case, have to be bought at a fearful cost. However this might be, there is no more to be said of our powers of resistance. It remains to see what could be done to hinder our enemy's escape, should he determine on retreat, or, if it were impossible to destroy his army altogether, how we might inflict on him the heaviest losses. These are questions, it need hardly be said, which would be of great moment in deciding the result of the war in which we were engaged, as the army employed in an invasion of England would be a numerous army, and such that its destruction, or its return greatly weakened, would be a heavy blow to the Power that sent it forth. Three hypotheses have to be considered with regard to the enemy's retreat: firstly, he might find himself in front of a position he deemed too strong to be assailed with a reasonable prospect of success. This position might be the defences of London itself, or were it between the sea and the capital, he might think that the *détour* necessary to turn it was too long to be safe, under the short limits of time that a merely temporary command of the Channel imposed on him. A second supposition is that he might have delivered one or more unsuccessful assaults, which is the case most favourable to us. Lastly, he might have succeeded in taking our position, but, finding us resolved on the continuance of the war, determine to make good his retreat, if there were yet time to do so. This, however, is the least likely case of the three, depending, as it does, on the double contingency of his success in the assault and of our resolution not to conclude peace in consequence. It is certain that, on any of these hypotheses, his army would feel, more or less, the disheartening influence of failure, and this would not be a trifling advantage to us, if Napoleon were right when he said that "*Les choses morales sont les trois quarts de la guerre.*" In the case of a retreat after one or more assaults on our intrenchments, his numbers might be so far diminished as to enable our Field Army, which would not yet have been seriously engaged, to assail him with a good prospect of success, thus availing itself of the advantages

which, I have said, would accrue to the offensive in tactics from the nature of the country. Again, it might be that this army would have placed itself across the line of retreat in a favourable position for defence, where it might, if time permitted, intrench itself strongly, and call to its assistance, by railroad, reinforcements from the garrison army, which could be spared from points not threatened, as soon as the line which the invasion would take had become manifest.

It must be allowed that, in defending himself against forces following his retreating columns in rear, the enemy would be favoured in the manner mentioned in speaking of rear-guards; but, in truth, this kind of pursuit is always the least to be feared, and the retirement of an invader should be more difficult in a close country than that of a defender's army, as the former cannot tell with certainty from what direction attack may come. The army of the defender, if compelled to retreat, has often only to guard its rear, but the invader in such a case must always watch the flanks as well, and even, in most cases, push a strong advanced guard far enough ahead to give him timely warning and present sufficient resistance, should his opponents have placed themselves in force across the line of retreat, or to clear the way of smaller bodies, without delaying the march of his columns. The closeness of the country would materially increase the difficulties of the enemy's *éclaireurs* in performing their duties, and we should be much to blame if we did not take advantage of this to harass his march constantly, until the time came for decisive action, if we thought ourselves strong enough to assail him in a pitched battle, or to cut off altogether his retreat.

Our efforts ought to be directed to the destruction of the enemy before he reached the coast, as, perhaps, we should not be able to interfere much with the actual re-embarkation. He would in all probability, as has been said, have taken possession of one or more harbours, and intrenched them strongly, both to provide for the contingency now supposed, and for other purposes already mentioned.

Before, however, he could gain such a refuge, I cannot but think that we ought, if unable to cut off or rout his army, at least to have inflicted on him very heavy losses. We ought to have taken advantage for this purpose of every favourable position on the line of retreat. As it would be necessary for him to reach the coast before we regained possession of the Channel, he could not spare the time to turn these positions, but would be compelled to assail each of them in front. It would be easy for our forces, provided they were handled with judgment and presence of mind, to cause him severe loss, and yet to retire before he could retaliate effectually, especially as he would have no leisure to pursue, except on the direct line of retreat. Every defile ought to be watched by horse artillery (with an escort of cavalry or mounted riflemen), which could not fail to cause delay, while it was being driven off, or loss, if an attempt was made to pass through large numbers while it was still in position.

On the whole, it seems clear that, even if the invader made good his retreat without being defeated in a pitched battle, it would only be with sadly thinned ranks that he would regain his cavalry.

Concluding Remarks.

The first question that arises, after a discussion of the general features of tactics and strategy in an English campaign, would seem to be the following:—Is the defence of the country favoured by the nature of the ground? To this I should give an answer in the affirmative. Of course, that answer would mean simply that the ground was more favourable than in the territory of most other civilized nations. If the reasoning of this essay has been right, it would generally be advantageous to ourselves rather than to the invader for the great majority of purposes. It may seem an important exception to this remark that the ground has been described as favourable to the offensive in tactics under ordinary conditions. But this exception is apparent rather than real, if, at least, it has been shown that we should have no need to receive the invader's attack without some preparation, and that with preparation, the ground would not generally be unfavourable.

No doubt, as cultivation advances, and the subdivision of property increases on the Continent, the face of the country will become in some respects less unlike what we see in England, and even now it is, perhaps, true, that battles have recently been fought less often on open hills and plains than was the case formerly. However, there would still be a marked difference between an English campaign and any that has actually occurred in the present day. (14)

No doubt, when an enemy had once passed the sea, he would hardly find any great natural obstacles to his advance. But in fact, few, if any, such obstacles exist in Europe that have effectually hindered, or that will ever effectually hinder, the march of a skilfully led army.

Whatever may be said of the natural advantages of our country, it is necessary to observe that they would disappear, if they were not skilfully turned to account by Officers of all ranks, from the highest to the lowest. In fact, if the enemy unhappily proved superior to us in his Officers, the nature of the country would become an advantage to him rather than to its defenders. On this effect of a close broken country, I may cite the great writer to whose teachings the Germans partly ascribe their triumphs of late years: "Certainly, when the par-"tition of a force is greater, then, through the diversity of action and "greater scope in the use of means, the influence of intelligence must "increase; and even the Commander-in-Chief may show his talents to "advantage in such circumstances. . . . . In such a case, the "courage, the dexterity, and the spirit of individuals will prove de-"cisive."[1] As to the need of skill and experience in the higher ranks, he says, "The talents of a General have most room to display them-"selves in a closely intersected, undulating country. In mountains, "he has too little command over the separate parts, and the direction "of all is beyond his powers; in open plains it is simple, and does not "exceed those powers."[2] Of the Officers of the lower grades it may

[1] "Clausewitz," Bk. V, ch. 17.
[2] *Ibid.*, Bk. III, ch. 4.

be said that they would require something besides the drill of the barrack square, or even the theoretical knowledge learned from books, necessary as both of them may be. They would require an eye for ground, a practical skill in minor tactics, such as few men can be supposed to possess in a high degree unless, in default of experience in war, they have had an opportunity of at least acquiring some experience during peace manœuvres in a suitable district. In truth, these manœuvres are so useful to all, that too much pains could not be taken in making the likeness to real warfare as close as possible, and in varying the locality and the general idea of the exercises.

What has just been said of Officers applies also in a certain degree to non-commissioned officers, whose zeal and intelligence will be more often put to the proof than in most other countries. This will especially be the case in the command of patrols, and generally in the minor operations of war.

If, then, our Officers and, if possible, our non-commissioned officers be equal to the occasion, it is my opinion that our country is favourable to a defence of the nature described; but it may, perhaps, be objected that my scheme depends mainly on the adoption of the defensive and the use of intrenchments, and that the moral drawbacks to any such scheme would outweigh its material advantages. I venture to think that such an objection would be unsound. In the first place, our retreat before the enemy would have been too short to have much effect on the spirit of the troops, even were it carried to the neighbourhood of London. In the second place, if it be argued that reliance on intrenchments and preparation of the battle-field impairs the spirit of troops, and renders them slow to quit cover and unwilling to take the offensive, it may be answered that the proposal is to trust mainly for defensive action to a garrison army distinct from our army of manœuvre. But even were this not so, I cannot admit that the use of such preparations has, at least constantly and under all conditions, the ill effects asserted; for, were it so, it would be equally improper to make use of natural shelter, or even to order the supports and reserves of an extended line to lie down under fire, to which, indeed, at one time an objection seems to have been made that would now be thought ludicrous. Moreover, to support theory by fact, the English Army in the period of perhaps its greatest glory did make use of field-works, or of the improvement of existing buildings and obstacles, as, for instance, at Talavera, Fuentes d'Onor, in the neighbourhood of Bayonne, and finally at Hougomont in the battle of Waterloo. I hold, then, our country to be more favourable to defence than most other parts of Europe, and I have tried to show how we might, perhaps, inflict on an invader heavy losses, if not utter ruin; but I am far from thinking that there are no weak places in our armour, or that it is not incumbent on us not only to maintain but even to develop our means of defence. Our regular army is, undoubtedly, weak in numbers, though it is true that the Army Reserve has not yet reached its full strength. Our Militia would render valuable assistance in the Field Army, had it been embodied for some time before the invasion, but otherwise would be of little use, except for the purposes which, in this essay, have been

supposed to be fulfilled by the Volunteers. But there are other weaknesses besides numerical weakness. It is not necessary to insist on the youth and immature physique of the bulk of our infantry of the line at home, as this failing would not be so apparent in a short campaign, in which comparatively little hardship would fall to the lot of the defenders; but our ranks would be full of raw recruits, lads only lately brought under discipline, with no training in the difficult art of fighting in extended order, some of them perhaps even deficient in musketry instruction. Again, on how large a proportion of our sergeants and corporals could we rely as possessing the qualifications for patrol leaders in a difficult country? Fortunately this matter of non-commissioned officers is at present a difficulty to other nations. Of the training of Officers by manœuvres I have lately spoken. Doubtless much more has been done of late years for this purpose, and our military authorities have shown themselves fully aware of its importance; but it lies with the nation to grant the money for carrying on and even improving this kind of instruction. I have also mentioned some points in the armament and equipment of our troops which, I venture to think, are worthy of consideration. How to supplement our natural advantages by permanent fortifications is a question unsuitable to this essay; but I may, perhaps, remark that all the purposes of a short campaign would seem to be perfectly well answered in these days by the carefully prepared field-works to which I have several times alluded. If, however, it be permissible to allude to any weakness in material preparations, it may be pointed out that Woolwich still remains our only arsenal, and that the fall or even the investment of London would either compel us to cease our resistance or, at least, throw us entirely on the resources of private works, not to mention the inconvenience that would ensue were it thought fit to remove "plant" and stores from it at the approach of danger. (15) It seems a principal deficiency in our means of repelling an attack that, although our infantry (had the militia been embodied for a sufficient time previous to the invasion) might be ample for our requirements, considering the use that could be made of the Volunteers as garrison troops and in specially prepared positions, it cannot be said with equal confidence that we should have a proportionate strength of artillery and cavalry. Though we might put on foot, as in the Mobilization Scheme, eight army corps, averaging perhaps 15,000 or 16,000 bayonets, we have not, in all, much more than 300 field guns at home, and our cavalry strength is only about 10,500 sabres, and for some time after a declaration of war these numbers would probably be lessened until we had time to raise and train additional forces of these arms. I have, indeed, suggested measures which seem to me calculated to partly remedy these deficiencies, but at present they undoubtedly are grave shortcomings, and the weakness of our artillery might probably prove a serious impediment were it thought fit to take the offensive in great force, unless more field batteries had been added to the regular army.

No doubt there exist great preliminary difficulties in the way of an invasion, namely, that of transporting a large army to our

shores; that of effecting any landing in the face of the opposition with which it would be almost sure to be met; and that of landing a sufficiently large force to cover the disembarkation of the whole before we had time by means of our railway system to effect a concentration on the threatened point. But it seems generally admitted that it is not well for us to rely wholly on the difficulty of landing in force, any more than it is well for us to rely wholly on the protection of our fleet. It seems, in other words, admitted that we ought to have land forces sufficient to oppose, with a reasonable chance of success, any army that an enemy is likely to place on our shores. How then do we stand in respect of our chances of offering this successful opposition? I do not say that there would be no chance of offering it, were the occasion to arise to-morrow. I think, for reasons which I hope I have sufficiently explained, that we are more favoured by nature than most other countries in this respect, even were our great defence, the sea, to fail us altogether. But, on the other hand, what deficiencies in our strength and in our military institutions would a wholly unforeseen invasion reveal! Deficiencies that could be removed without any great expenditure of public money. Let us suppose that the enemy had landed an army of only 150,000 combatants—the number that Napoleon proposed to bring 75 years ago. If our militia were fit to take their places in the line of battle under ordinary conditions, which they certainly would not be without some previous embodiment, fine as the raw material of that force undoubtedly is, the numbers of our infantry might be adequate to the contest, but our cavalry and artillery would hardly be more than sufficient for an army 70,000 or 80,000 strong (even allowing for the peculiarities of the country), after deduction had been made of the portion of these forces that would have to be set aside for the garrison of Ireland and other special purposes. In these circumstances, we should probably be reduced to the purely passive defence of a campaign of positions, and, even should the enemy decide on a retreat, we should hardly be able to inflict any such losses on him as would influence the result of the war.

It cannot, therefore, I will say, in conclusion, be too clearly pointed out to the English people that their military expenditure errs rather on the side of defect than on that of excess, even if we consider only the possibility of an invasion; that our regular army is deficient in cavalry and artillery; that no effectual means are, at present, provided to supplement its strength in those arms by the auxiliary forces; that our Officers are not given the same opportunities of acquiring some practice and experience in peace-time as are open to those of other armies, and that no measures have yet been taken to secure for the future the services of old non-commissioned officers, a class especially useful under the conditions of a campaign in this country. I say nothing of defects that have no particular relation to the present subject, but the list is, I think, still worthy of public attention. It may be that our natural advantages, the merits of our existing military institutions, or the excellence of the raw material of our forces might outweigh in the end all drawbacks, but this is no argu-

ment against their removal, especially if that removal would, as I think, be neither difficult nor excessively costly.

Appendix.

(1.) On the subject of intrenching tools and the desirability of their being carried, if possible, by the soldier himself, it may be remarked that Napoleon appears often to have regretted that he never carried out his intention of giving a tool to every man in his infantry.

The following are the remarks of General Brialmont on this question ("Fortifi- "cation du Champ de Bataille," 1878, p. 83, &c.) :—"It is proved by experience "that when tools are carried by alternate pelotons, companies, or ranks, there takes "place an enormous loss of them, as a soldier only preserves carefully what belongs "to himself individually, or serves exclusively for his use. Experience has proved also "that when tools are carried in wagons forming part of the engineer park or of *Co-* "*lonnes d'outils* they arrive generally too late to be usefully employed. . . The "employment of improvised intrenchments can then only be rendered general when "portable tools shall have been given in sufficient numbers to each battalion and "company to execute such intrenchments in a few minutes. This is what the Ro- "mans understood, and what experience has equally taught American Generals, "who, the first in modern times, have made much use of improvised fortifications." The following is the distribution of tools to a peloton of 64 privates, suggested by this distinguished writer :—24 spades, 4 pickaxes, 12 small hatchets, 12 billhooks, 8 saws, 4 rammers ; total, 64 (maximum weight of each tool 1 kilogramme). Double these numbers for a company of three pelotons.

The following remarks of Baker Pacha seem worthy of attention. He says of the spade in his "War in Bulgaria" (II, 27) :—"An important point highly developed "by this war was the absolute necessity of the constant use of the spade in military "operations. . . Unfortunately the British soldier in the field is a bad workman "with the spade, but this results merely from the want of habit and practice. . . "This evil arises from the present custom of giving working pay. The British "soldier is taught that he has never to work with the spade unless he receives extra "pay for so doing, and as that extra pay must be a matter for a special vote by Parlia- "ment, the whole system tends to give the soldier as little instruction as possible in "this most necessary duty. The extraordinary value of a system of shelter trenches "or light field fortifications was constantly exemplified during the war. I never "saw, during the campaign, a position which had been lightly fortified in this "manner taken by a front attack, by either one side or the other."

Such tools would be by no means superfluous even when acting on the offensive. As to this I may quote the report of General Skobeleff as to the action at Plevna on September 11, 1877 :—"The musketry directed against our left wing grew a little "weaker about half-past five, and our men might on this side have made themselves "cover rapidly, and rendered difficult of access the positions, of which the capture "had just cost them so dear, but the almost total absence of portable tools forbade "it."

The following are the solutions which have been arrived at as to this problem of the method of carrying and of the numbers of intrenching tools. As I have stated above, General Brialmont proposes to give tools to two-thirds of each company. In the German, Russian, and Austrian armies they are, in future, to be carried by the men in the following proportions :—

One Battalion.

Tools.	Germany.	Russia.	Austria.
Light spades	200	320	396
„ pickaxes	20	80	
Hand axes	40		

In the United States also, the tools are carried by two companies, in turn, out of each battalion. In our own Service, at present, sufficient spades and pickaxes for a battalion are to be carried in a cart with two horses.

I should wish to draw attention to a method of carrying tools which, besides its general merits, would, I think, be particularly useful in operations in this country—that of carriage by pack-horses. This method was practised with success by the Turks in the late war, one horse being assigned to each company. It may be observed also that the same plan was found by them very useful in the supply of water, one horse being also assigned for this purpose to each company. It has, moreover, been determined to adopt this plan in France, thirty-two shovels and eight picks being so carried for each company. No difficulty arose in the late war in bringing up animals to a short distance from the shooting line without great losses.

(2.) With regard to this question of long-range fire, it seems unfortunate that the admirable weapon now in the hands of our infantry has its powers to a certain extent limited by being sighted only up to 1,400 yards. It may be pointed out that the Mauser rifle of the German Army is sighted up to 1,750 yards, and the fusil Gras of the French Army up to 1,960 yards. With regard to the difficulty of supplying ammunition, the system of pack animals seems worthy of consideration, and peculiarly suited to a country like our own.

(3.) Von Moltke, "Observations on the Influence that Arms of Precision have on "Modern Tactics," translated by Lieutenant Crawford, R.A. "Because in modern "warfare the long range and destructive fire of artillery necessitate a scattered "formation, there will be more frequent opportunities for those brilliant dashes of "small bodies of cavalry, in which, by taking advantage of the critical moment, the "cavalry of division so often distinguished themselves."

(4.) Speaking of opposition to an enemy's cavalry, Major-General Hamley says in his "Operations of War" (Part VI, chapter 5) :—"Some force which should com-"bine the celerity of cavalry with the formidable fire of infantry would exactly suit "the case; and such is to be found in a corps of mounted riflemen. Nor would the "performance of advanced post duty by any means exhaust their functions. For "seizing a post or defile before infantry could arrive there and which cavalry would "be incompetent to hold—for rapidly turning a flank—for executing distant enter-"prises against communications, mounted riflemen seem the inevitable solution of a "problem, the conditions of which are speed of movement with ability to contend "with any kind of force. The Prussians propose to meet the case by arming their "light cavalry with a better weapon. But this is only to create a more expensive "and less efficient kind of mounted rifleman. Size and weight of man and horse "are worse than superfluous, where celerity, accuracy of aim, and readiness in ob-"taining cover are the requisites. Light men on small horses, steed and rider "active and enduring, with excellent weapons and careful training, will compose a "description of force such as has not been seen on any modern European battlefield. "The nature of the service would render it especially popular with the active, the "enterprising, and the ambitious; and (supposing we were desirous, for once, of "devising something in war, instead of copying foreign examples, in the way the "Chinese artists copy Italian pictures) it would not be easy to lead the way more "effectively than by organizing a force of mounted riflemen. . . Mounted rifle-"men would be so generally effective, that the only limit to their numbers need be "the means of maintaining them." In addition to the opinion of this great writer, it may be recalled that the late Colonel Chesney most strongly recommended to us the formation of such a force.

It may be objected that, as Baker Pacha tells us in his "War in Bulgaria," the Russian dragoons (a force acting in the manner proposed) did not effect much in the late war, but it may be answered that the Russian cavalry proper were more than once successful when dismounted; and certainly, if horsemen are to act on foot, a force trained specially to that manner of fighting ought to have the advantage. "Tirnova, defended by three battalions of Turkish infantry, was taken by "dismounted Russian cavalry. Kesanlyk also was captured by dismounted cavalry." (Major Shaw, "Elements of Modern Tactics.")

It may be mentioned that, in the dismounted action of cavalry, a great drawback has hitherto been the number of men required as horse-holders. It has been considered necessary in all European armies that the horse-holders should remain mounted. In which case one man cannot take charge of more than, at most, two horses besides his own. Against the dismounting of the horse-holders it is urged that troops could not, in that case, mount and get away again with the same rapidity. But with a force whose sole purpose is fighting on foot, this objection would not have so much weight, and a dismounted man could hold at least three horses besides his own, and would have the additional advantage of more easily obtaining cover.

(5.) On this subject General Brialmont remarks :—"It is not impossible that "before long, by reason of the importance that intrenchments are acquiring in field "operations, the parks of armies will be provided with a certain number of short "siege guns of 12 or 14 centimetres to arm or attack redoubts. This would, from "several points of view, be a real step in advance."

(6.) It is, perhaps, proper to make a few remarks as to the means of forming slight cover out of our different kinds of inclosures.

Firstly, with regard to hedges, if there were no time to obtain more than cover from view, it would be expedient to make such openings as would admit of observing and firing on the enemy. The soldier should be trained, in this as in all kinds of fighting in extended order behind cover which merely concealed him from the enemy's sight, to move aside after delivering his fire. Should the hedge be too densely grown to allow of openings to be made in the time available, the lower part will be probably thin enough to admit of the soldier firing through it.

Should, however, a very little additional time be available, a shelter trench may easily be formed in rear of the hedge, which may further be strengthened by *bonnettes*, the earth of which would be supported by the hedge. Should it be desired to provide further cover, a parapet might be raised on the side next the enemy, the hedge serving as a revetment.

With regard to hurdles, they might be utilized in the same way as low hedges, either as merely serving to afford cover from view, or as a revetment for earth thrown up to afford cover from fire. In the former case gaps would be made for observation and for fire, as in the case of hedges.

The same remarks, of course, apply to wooden fences. With regard to walls, they are undoubtedly a valuable protection against rifle and shrapnel bullets, but it must be observed that, if exposed to fire of artillery, they might be destroyed by common shell with percussion fuzes, and that, in this case, the troops behind them would sustain more injury from the splinters than they would have suffered had they been in the open. However, were the wall low, *or were there sufficient time to reduce the height of a higher wall to about three feet*, it would shelter men kneeling or lying down from bullets, while giving too small a mark to run much risk from shells. High walls, if they are in such a position as not to be exposed to the fire of artillery, or in skirmishes where the assailant has no guns, may easily be made a very formidable obstacle. They would, of course, be loopholed, care being taken that the openings were made at such a height from the ground that the enemy could not make use of them. This might be done either by a trench or *banquette* in rear or by a ditch in front. Two tiers of fire might, if time allowed, be employed, the lower tier firing lying down, and the upper tier from a platform of planks supported on anything available, such as casks, &c. Flank defences might, in some cases, be provided by means of tambours. It is, however, to be observed that high walls are by no means common in England except in the interior of towns. Walls, like any other kind of enclosure, can of course, if required, be used as a revetment.

(7.) On this subject I may quote a paper in "Macmillan's Magazine" (November, 1872), translated by the late Colonel Chesney from the German of Major-General Baron von Scholl, late Minister of Defence in the Austrian Cabinet, "On "the Defence of England." Speaking of the force required to oppose a disembarkation, he says :—"A moderate number might prove quite sufficient. For landing an "army is an operation which, to be successful, should not be in the least impeded "by the enemy, even though weather and coast are favourable. If we consider

" successful instances of landing, as in 1840 at Beyrout, and in 1854 in the Crimea, " we should not forget that these landings were not in the least disputed by the " enemy, while, on the other hand, another case in 1840 shows that 300 troops with- " out any guns were able to prevent the landing of the crews of three men-of-war " (the 'Benbow,' 'Carysfort,' and 'Zebra'), carrying together 124 guns. The risk of " being forced to retire by the smallest resistance is the reason why naval Officers of " experience are so careful in selecting places of disembarkation. This is particu- " larly the case when the disembarkation is on a large scale, for, then, there is more " time for bad weather to come on, and the danger arises lest the party landing " should be obliged to break off their operations, leaving the troops already on shore " to their fate, when they would probably soon be thrown into the sea by superior " forces. This is the reason why different points of the coast are of very different " importance to the defender, with respect to a landing. Small bodies of troops " could land almost anywhere, but entire armies only where the locality is peculiarly " suitable."

(8.) This difficulty of procuring sufficient transport is certainly one of the great obstacles to an invasion of England. I may mention the calculations made by Major-General Collinson in a lecture given at this Institution in January, 1878. He considered that the following tonnage would be requisite for a corps 30,000 strong:—

30,000 men (1 ton per man).....	=30,000	tons.
5,000 horses (3 tons per horse).....	=15,000	„
700 carriages (10½ tons per carriage)...	= 7,350	„
	53,350	„

It may be remarked of this computation that the number of horses seems inadequate, but it was the number allowed by that eminent writer the late Colonel Chesney. It seems, however, that considering the facts with regard to the supply of ammunition to which I have alluded, the tonnage allotted to carriages, which heading includes stores, would not now prove sufficient. Major-General Collinson calculated that France could, immediately after a declaration of war, provide transport for about four such corps, Germany for about three, and Russia for about two. It would hardly seem, however, that even the largest of these forces would be sufficient for an invasion of England.

I may mention a few facts in support of what I have said as to the greatly increased quantity of transport now required for small-arm ammunition. The following is a table of the quantities of ammunition allowed to each man by the present regulations of five Great Powers:—

	Rounds carried by man.	Rounds in regimental reserve.
England.....	70	70
Germany.....	80	37
France.....	74	18
Austria.....	84	35
Russia.....	60	60

It would seem, however, that these quantities are likely to be even exceeded in the future. A very competent Russian authority, General Zeddeler, who not only served in the Russo-Turkish War, but had also accompanied the Prussian Staff during part of the campaigns of 1870 and 1871, recommends that each man should carry 105 rounds, that 25 rounds per man should be carried as a reserve on pack-horses, and a larger battalion reserve of 75 rounds per man in carts or wagons, making a total of 205 rounds. The expenditure of ammunition by the Turks in the late campaign was, as is well known, enormous. Baker Pacha mentions that two battalions and a wing

serving under his command at the Battle of Tashkessen expended respectively 263, 273, and 293 rounds. On some occasions it is said that as much as 400 or even 500 rounds per man were expended. The ammunition supply of the Turks, as given by the author just quoted, was 100 rounds carried by the soldier, 60,000 rounds per battalion carried on pack-horses, which would give an average supply of 100 per man, and 100 per man in the army reserve. It may be remarked that, although the Prussian forces in the war of 1870 and 1871 fired only at short ranges, and were excellent in fire discipline, it seems that in every serious engagement at least a portion of the infantry ran short of ammunition.

(9.) I think it may be assumed that in a short campaign, and one of such obvious and vital importance, effectual measures might be taken to prevent the enemy obtaining any information by means of our newspapers.

(10.) On this subject I may quote the paper by Baron von Scholl, to which I have already referred. "If London must be fortified, I would plead for an indirect de-"fence, viz., not for fortification by means of a zone of detached forts (direct forti-"fication), but for the erection of small sized fortresses at a greater distance from "London, and besides these for a light *enceinte* near London." If this scheme were carried out, it might be a question at what distance from each other the small sized fortresses should be placed. It seems to me that they must be placed sufficiently near together to prevent an army from passing between them without being endangered by the presence of their garrisons. For this purpose it is necessary that there should be no point between two of them distant more than one long march from either the one or the other, or in other words, that the maximum distance between any two of them should be two marches.

(11.) As the plan of campaign proposed depends entirely on the capability of resistance of field-works, it is perhaps proper to give one or two opinions in support of the view of that capability taken in this essay. Field-works are divided by General Brialmont into two classes, that which he calls "*fortification improvisée*," and that which he calls "*fortification provisoire*," or "*passagère*." The former class comprises all kinds of hasty intrenchments; the latter are more elaborate works, such as those of the Turks at Plevna. It is on this latter class that it is proposed to rely for effectually barring the march of the enemy to London. As to its strength, I will quote the opinion of Colonel Sarantchew, who commanded, till wounded, the 126th Russian Regiment in the late war, and whose paper is quoted at great length by General Brialmont in his "Fortification du Champ, &c." The following is given in italics. "The intrenched positions which it was easy to carry "in former wars are now almost impregnable, since the defender has been armed "with quick-firing weapons." The capture of Kars has sometimes been instanced to show the practicability of successful assaults on fortifications in the present day. The following is the remark of General Brialmont in his chapter on that subject:— "The assault of Kars would have ended in a bloody check, if the defenders of this "place had been equal to those of Plevna, and had not been demoralized by the "defeat which the army of Mukhtar had sustained a few days before." On the whole, I think, it may be asserted that such works are virtually impregnable, unless held by troops that have been thoroughly "demoralized," or attacked in some exceptional circumstances; or, at least, that an assault on them is so difficult an enterprise that it may be considered a strategic success if the enemy be compelled to deliver it.

(12.) Seeing that our strength in infantry is likely in case of invasion to be so great in proportion to our strength in the other arms, it is pleasant to read these words of that great writer, Clausewitz (Bk. V, 17): "It is undeniable that infantry "has a decided advantage over every other arm in difficult country, and that, "therefore, in such a country its number may considerably exceed the usual "proportion."

(13.) I may remark that the plan of campaign here advocated is that which has been recommended by great authorities, under similar conditions. The plan consists

in covering the capital from assault, and using the field army against the communications of the enemy. Marshal Saxe blamed the Generals of Louis XIV for covering Paris, in the later campaigns of that reign, by a direct defence of their armies. Napoleon wished, though he was prevented from doing so, to act in the manner advocated in the campaign of 1814. These are his words, in instructions given to the Committee of Defence, December 27, 1813 :—"There must be at Paris "30,000 or 40,000 men, independently of the National Guard, in order that the "army may act on the enemy's flanks without leaving Paris ungarrisoned." When the campaign was about to begin, he said, "The fortifications of Paris ought to "secure that town against any attack made without siege equipage, so that our "armies charged with the defence of the frontier, not being obliged to concentrate "on the capital, may manœuvre at will on the flanks and rear of the enemy." It may be objected that Wellington followed a different system in the campaign of Torres Vedras. But it may be answered that in those days it was more difficult to make field-works secure against attack than it is at present, unless they were held by a disciplined army. Moreover, it seems to have been the Duke's wish not to compel the enemy to an early retreat, but to allow him to waste his strength in front of those fortifications. I may also quote the opinion of the third great General of those times, the Archduke Charles :—"It is not enough to take up always a position "on a strategic line to cover it. There are circumstances in which it is much better "to establish oneself at a certain distance on the flanks. A good flank position "forces the enemy to change the direction of his operations to march against the "new obstacle presented to him." It may be remarked that this change of direction would not be possible to an invader in an English campaign for want of time. The following are the words of Marshal St. Cyr, in his "Mémoires" :—"It is never "prudent for the army charged with the defence to make a frontal resistance, lest "it should be drawn into fighting at once a defensive battle, in which it is so much "to the interest of the enemy to engage, in the beginning of his invasion, of which "a victory is in a way the indispensable preliminary; but that army may, with "advantage, attack him on his flanks and rear."

(14.) The effect of the cultivation on one well-known theatre of war, the North of Italy, is to a certain degree, but only to a certain degree, similar to that of the cultivation of England. In both cases troops cannot readily march except on the roads, and in both cases the ground is generally unsuitable to the action of cavalry in battle; but in Italy there is much less cover from fire, whether of infantry or of artillery.

(15.) Speaking of a central arsenal, Baron von Scholl, in the paper before quoted, says :—"I cannot refrain from saying that its importance appears to me so great "that every means should be adopted to call it into existence as early as possible. "At present all the supplies for the army are on the coast, which is at the same "time the frontier, and consequently so placed as to be most exposed to the enemy's "attacks. This is contrary to the natural order of things, and might lead to the "very worst consequences. Even Woolwich is not properly placed in view of war."

Wednesday, January 26, 1881.

ADMIRAL SIR FREDERICK W. E. NICOLSON, BART., C.B., Vice-President, in the Chair.

ON THE PROGRESS OF THE ELECTRIC LIGHT.

By R. E. CROMPTON, Esq., Electric Engineer.

I THINK there is little doubt that the year 1880 will be looked back to as a year of great progress in the introduction of the electric light.

The commencement of the year was marked by the natural reaction in public feeling consequent on the disappointment which followed the collapse of certain famous promises with regard to lighting by electricity. People felt that little had been done towards solving the problem of the introduction of the new light into our streets and houses. A certain great name had been used as a lever by unscrupulous manipulators of the price of gas stock, to unduly depreciate its value, and so produce a panic, which had disastrous consequences to many holders. Part of the discredit which should have fallen solely on the ring of speculators who were responsible for the panic, fell upon the electric light itself, and most unjustly so. This very materially retarded the progress and general introduction of the light. However, the possessors of good systems of electric lighting have lived down this feeling, and by perseverance in bringing forward and allowing thorough free trial of their systems, they have to a certain extent re-established public confidence; indeed, we now see a second wave of interest has been excited, which I hope will gather greater volume until it culminates in the general adoption of the light.

There is a widespread desire at the present moment for more light; this is evident by the fact that even our vestries have been driven to try the improved forms of gas-burners, which we now see at many principal crossings and street refuges.

This demand for more light, although it may be only a sentiment as regards our private requirements, comes to the front rank of necessities of modern scientific warfare. Darkness, that bugbear to the tactician, that friend to night surprises, secret expeditions, and the like, must no longer remain so. We must have darkness under control, in other words, having the means of readily and promptly lighting vast tracts of land or water to a brilliance only second to day by means of the electric light, we can have darkness at will.

Although everyone has seen the electric light in lecture rooms, railway stations and streets, perhaps on account of the very various forms in which it has appeared, and the mysterious way in which inventors have described new applications of it, seeming to go out of their way to impress on the public that they employ some new kind of

electricity, no subject in which such very simple principles are involved has been so clouded over and little understood. I think it will aid your understanding of my description of the recent improvements in electric lighting if I divide the whole subject into two heads:—

1. The means whereby we produce the required current of electricity.

2. The transforming of this current at any desired point into light.

Although Sir Humphrey Davy discovered the electric light eighty years ago, yet so long as the sole source of an electric current was a galvanic battery, expensive, fuming, uncertain, and cumbrous, so long did the light remain a mere laboratory appliance. Faraday's discoveries in dynamic electricity gave a fresh impulse to the subject, but the great stride was made about ten years ago, when a clever French workman, Gramme, combining in his dynamo-electric machine the self-exciting or reaction principle, discovered by Wheatstone, Siemens, or Varley (it matters not which), with his own annular armature, gave us for the first time a really cheap electric current; in truth, Gramme may be called the father of cheap electricity. The dynamo-electric machine consists always of the same series of parts, namely, a revolving spindle carrying coils of insulated wire, so wound on to it that they can be moved at great speed through the lines of magnetic force of a powerful magnetic field. I call these machines self-exciting, because this very current that is generated in the revolving coils, is used to excite the magnets themselves to give the required magnetic field. I have these coils as wound in the Gramme machine, such as are working in this room to-night. You see they are wound in segmental shaped sections on to a soft iron ring; all the ends of these sections are carried down to, and connected with these copper segments, thus the whole of the coils form one continuous conductor, the wire of which is bared at the sixty points, where connection is made with the copper segments. If I cause this spindle with its coils, which is generally called the armature, to revolve between two magnetic poles; two currents flow in the two separate halves; thus, if I draw a line joining the poles, the currents which flow in the coils on one side of this line will be positive, and on the other side negative. It is most advantageous to collect these currents at a point midway between the poles, on each half circumference; we call this point that of highest potential, and the way we collect the currents is by allowing a metallic brush to rest on the copper segments above described at these points, as we collect positive electricity at one brush, and magnetic at the other, it is evident that if we connect the two by a wire, we shall get a continuous current flowing through it. In self-exciting machines, this wire before passing to the external circuit there to do useful work, makes many turns round the cores of the large magnets, and thus gives the powerful magnetic field.

These three elements, viz., 1st, revolving coils; 2nd, collecting cylinder with brushes; 3rd, wire from same exciting the field magnets, are common to all dynamo-electric machines, the variations are chiefly in the general arrangements and method of winding the coils. For

instance, in the Siemens machine, the revolving coils, instead of being wound over and through an iron ring of considerable diameter as compared with its length, as in the Gramme above described, are wound over and across the ends of an iron cylinder of small diameter as compared with its length; the collecting cylinder, brushes, and exciting of magnets are the same as the Gramme.

The Bürgin machine, the armature of which I have here, combines features of Gramme and Siemens; instead of the coils being wound on to a single broad soft iron ring, this is divided into four narrower rings, or more properly, rectangles of soft iron wire. Each of these rectangles has a section of wire wound on to its flat side, leaving the corners of the rectangle bare; the object of this is to allow of greater magnetization of the soft iron; the collecting cylinder is similar to the other machines.

The Brush machine, which has lately been introduced into the English market, has a ring armature differing considerably from Gramme's, the ring is of cast iron, and has eight deep radial grooves in it; the wire forming the armature coils is wound into these grooves and fills them exactly flush with the surface of the iron; the collecting cylinder, also, is different to those above described; it is claimed for it that it is better suited for currents of extremely high tension and there is less chance of reversed polarity. It is so arranged that the current, instead of wholly passing around the electro-magnets on its way to the external circuit, is switched alternately through the magnets and through the external circuit. The large machines made on this principle give currents of six times the tension ordinarily given by the other machines. All the machines I have described give currents constant in direction, hence are called continuous current machines. I have not time here to describe machines giving currents alternate in direction; it is true that this is the oldest form of machine, and as such merits some consideration, but as this is not a history of the electric light, but a description of the latest machinery used for producing it, I have dwelt on those which are now most considerably used. I do not, for reasons hereafter to be mentioned, think alternating currents are suitable for your especial requirements—that is the production of powerful lights having great fog-penetrating power; moreover, it is certain that alternating currents are dangerous to handle. All accidents to life or limb which have occurred with the electric light have been with alternating currents; of such was that on board the "Livadia," at Aston Park, Birmingham, and elsewhere; whereas, I am not aware of any accident having occurred with continuous currents of moderate tension.

You now see how compact, simple, and free from complication are the modern machines, there is only one moving part, the revolving spindle. We have to consider how best to work this. On board ship it has almost in all cases been worked direct by a high speed engine coupled to the spindle itself. Brotherhood's engine, I am told, has been thus employed in nearly two thousand cases. Willans' and Gwynne's engines have also been used with success. The photographs on the table will show you very neat arrangements by which one

Brotherhood engine drives a pair of dynamo-machines, and the whole will go into a space of $7' \times 2' \times 2'$, and thus occupy a very small corner of the engine room of an ironclad; on land it is usual to drive these machines by belting, such is the case with the machines working to-night. A 10 h.-p. engine, slightly modified from the agricultural portable engine, drives eight machines bolted down to a tumbril or carriage; the tumbril, with the machines on it, can be drawn on a good road by two horses, and can be coupled up to the engine, and all bolts put on in a few minutes.

Having shown you what ready and simple means we have at command for producing a powerful electric current, we now must consider the best mode of turning this into light, and this brings me to the second part of my lecture. How does the electric current produce light?

Hitherto we have always produced light by raising bodies to intense heat, and so causing light radiance; at low temperature light radiance is small, at the higher temperature it is vastly increased. I need only remind you of the familiar illustrations of heated iron: at 1,000° F. it is red-hot and the light radiance is trifling; at 2,000° it is white-hot, the light radiance is dazzling, it is increased fifty-fold, although the heat is only double. Now, the electric light depends on no new gospel in this respect; by the aid of electricity we can raise bodies to extremely high temperatures, in fact, unapproachable by other means, and to cause them to afford an extreme light radiance. To obtain such temperatures we interpose bodies of high resistance in the path of the current. One fundamental law of electricity is that its currents develop heat in any bodies through which they pass, precisely in proportion to their resistance. It is not the place here to explain to you what is resistance; we do not know how electricity passes bodies, whether through or between their particles; at any rate, we do know that given two conductors of similar material, the conductor of the larger cross section offers less resistance than one smaller, and conversely; the material also of the conductors is of the highest importance.

Taking two extreme cases, copper and silver are nearly equal to one another at one end of the scale, as offering least resistance. Carbon is at the other end of the scale, offering a resistance 150 times as great as either of the above; therefore, if you accept the fact that by interposing a high resistance you get a high temperature, a slender rod of carbon appears as the most suitable material for us to use, and this virtually gives us the most simple form of electric lamp. I must here remark that I have inverted the usual order in which electric lamps are described; as arc regulating lamps were the first used, they are generally the first described, but as obtaining the electric light by means of the arc is decidedly not the simplest method, I propose taking the incandescent lamps first.

When we use a slender rod of carbon as a lamp by raising it to vivid incandescence by passing a current through it, we meet with a difficulty, the carbon burns away, it combines with the oxygen of the air to form carbonic acid. We must either exclude the oxygen or

provide means for replacing the carbon as it is consumed. The first method appears the simplest; in early days of the electric light, a great many efforts were made to enclose the carbon in a glass globe, and obtain as perfect a vacuum as possible in the globe, by means of an air-pump. But the vacuum, if even at first tolerably perfect, never remained so for any time, and the carbon was slowly but surely destroyed. The next step was to remove the oxygen, but allow the nitrogen to remain; this, although it did away with some of the troubles due to leakage, still did not ensure long life to the carbon.

The nitrogen, although chemically inert, scoured away the plastic surface of the intensely heated carbon by the pelting action of the molecules. To ensure perfect durability, a perfect vacuum appears to be necessary, and this is, after all, what has been accomplished by our countryman, Mr. Swan, of Newcastle, in his beautiful little carbon filament lamp, which I now show to you. It is extremely simple, a carbonized thread is bent up into a double horseshoe, and connected to two fine platinum wires; the whole is enclosed in a little pear-shaped glass globe, from which the air is exhausted by a variety of the Sprengel pump, invented for this special purpose by Mr. Swan and Mr. Stearn, of Birkenhead. The vacuum in these lamps is extremely perfect; you see what a pleasant soft steady light they give. I don't think anyone could desire more in the way of a pleasant light for his house. As far as we know their durability is great, some of them have been in use for several months, at all events, I think you will admit that even if they only last a single month they will be a most perfect solution of the problem of lighting 'tween decks of ships, the cabins; and even have, I think, solved the knotty problem of safely lighting the magazine, for it is evident that by a second covering of strong glass, they will be made absolutely safe, and I believe that even if fractured, the filament of carbon would immediately pass away like a breath, before it could fall on and ignite any combustible.

The researches of Edison we have heard so much of were all in this direction; it is said that he has at last succeeded in producing a lamp somewhat similar to Swan's. Within the last few weeks another countryman of our own, Mr. Lane Fox, has brought out a lamp very similar to Swan's, with, I believe, great success. I call all this class true incandescent lamps; there is no combustion; the whole of the light is afforded from the light radiance of the carbon heated to a high temperature by the passage of the current.

Another class, which I call the quasi-incandescent, do not protect the carbon from the action of the air; they provide a considerable length of extremely thin carbon rod, and pass the current through a quarter of an inch in length of one end of it, the light afforded by the incandescence of this piece is aided by that from its combustion, which thins down the end, thereby increasing the resistance and, consequently, increasing the light. As the end wastes away, the carbon rod is forced forward to crush it down, and this supplies new material for the action of the current. The André, the Regnier, and Werdermann lamps are all varieties of this class, and have been fairly success-

ful, but seem likely to be entirely superseded by the true incandescent class.

It is obvious that we can get a maximum resistance by making a break in the circuit, but such a resistance would be unmanageable with currents such as we use; we should get no current to pass; but if we pass the current through two thick carbon rods, the ends of which are first brought into contact and then slightly separated, the current does not cease to flow; we obtain a stream of fine particles of carbon across the gap; this is called the electric arc, and the intense resistance to the passage of a large current being concentrated on so small a spot, the temperature and consequent light radiance is from twelve to fifteen times that we can obtain from simple incandescence.

I will now put the current into a lamp, using the arc. You see what an enormous increase of light I obtain from about the same electric current as I am using with the Swan lamp. The intense whiteness of the light shows the enormous temperature which has been attained at the surface of the upper carbon. You will wonder, then, why we do not always use the arc, so superior as it is in the amount of light and consequent economy of current. The reason is this: once we make this break in the circuit to obtain the required resistance, that resistance no longer remains constant, but varies continuously, and through wide limits. We no longer use the same portion of carbon, lasting for an indefinite time; on the contrary, the action of the current at the arc wastes away both carbons unequally, and in a variable manner. For your particular purposes you have not met with these difficulties to the same extent as we have in using the arc for commercial purposes. You use a hand regulator, such as I have here; the carbons are carried in slides, and are moved towards each other by the sapper who works it, so that he, by careful watching, compensates these irregularities in the resistance, and so keeps the current pretty constant; but when we require the arc on a large scale, the lamps must be automatic, and we have to supply the place of the intelligent sapper by self-acting machinery. Some inventors, considering these difficulties too hard to face, met them in a half-hearted manner by altering the character of the dynamo-machine; they went back to the use of the alternate current, and so were able to simplify the lamp down to what is called an electric candle; that is, they put two rods of carbon up side by side, and maintained them at a fixed distance apart by an insulating space filled with plaster of Paris.

The arc, commenced at the top, is formed between the two rods, the plaster being melted away by it as the carbons wear down. This is the famed Jablochkoff candle, which has had wide application, but which has never been very successful in this country, on account of its want of economy and the very unsteady pink-coloured light given by the arc. Moreover, the alternating current, as I have before shown, is not suitable to naval or military requirements, from its poor fog-penetrating power and its being dangerous to handle.

Turning now to those who have faced the more difficult problem, we find that it consists of these main requirements. We have to

provide an arrangement for carrying a pair of carbons in such a manner that they can be approached towards each other, end to end, as those ends are wasted away. These ends must be touched together in the first instance, to allow the current to commence to pass, again touched together if at any time the light should be accidentally extinguished; again they should be drawn further apart, so as to lengthen the arc, when the current is too strong, and the converse when the current is weak.

All have approached this problem in the same way, in that they have obtained the controlling power over the movement of the carbons by the action of the current itself exciting certain electro-magnets in the lamp, to work the proper mechanism.

Of five makes of lamps in very general use, viz., the Siemens, Brush, Brockie, Serrin, and Crompton, the first three have a common feature in that they fix the lower carbon in a frame, the upper one descending towards it in a slide; Siemens retards its descent by cutting a rack on this slide and gearing into it a pendulum escapement, somewhat similar to that of a clock; an electro-magnet is so arranged that it lowers the slide gradually as the carbons are consumed, and when the magnet is at the end of its stroke it allows the escapement to come into action. If the carbons are approached too near, the strengthening of the current, thus caused, imparts a lifting action to the same magnet. In the Brush lamp, the retarding movement of the upper carbon slide is by means of a piston working in glycerine. In this lamp there is, also, an electric magnet which lifts, lowers, and locks the slide, so as to obtain the resistance approximately constant. In the Brockie lamp, no attention whatever is paid to the strength of the current, but at regular intervals of time, the upper carbon is dropped on the lower one and again raised at a fixed distance. This movement is worked by means of an electro-magnet, excited by a current separate from the lighting current, and having its own wire, these regulating movements are, as it were, telegraphed to the lamp from the dynamo-machine, by means of a revolving contact-breaker worked at the machine, and making periodical breaks in the circuit of the separate wire.

In the Serrin and the Crompton lamps both carbons move; the lower one is fixed in a frame which can descend through a limited stroke so as to form the arc in the first instance, or if afterwards accidentally extinguished, the upper carbon descending only to supply the waste caused by the burning of the ends. In my own lamp I obtained a very great regularity in this movement, which we may call the feed-movement of the carbon; in all the other lamps the whole of the carbon and its rod has to be moved up or down, whenever a feed-movement is requisite; in my lamp a very small part, only weighing a few grains, has to be moved by the slight weakening of the current, which we depend on to start this feed-movement. The delicacy of this movement is of the highest importance in obtaining a steady light from the arc. If the feed-movement occurs at long intervals of time, extreme unsteadiness and a flickering and ghastly-coloured light follows; whereas if the movement is constant and regular, the arc is

maintained of equal length, and if the carbons are of good quality the light will be steady and white. I now show you a Serrin lamp and one of my own. You will see how the irregularity in the feed-movement of the former affects the steadiness of the light; in the latter one, the movement you will see is almost continuous, and the arc remains practically of constant length.

Carbons also have been much improved of late; however good may be our lamps we cannot get a steady light unless the carbon be uniform throughout in hardness and resistance; the carbon must be very pure; any salts of sodium or calcium reduce the resistance of the arc, and spoil the whiteness of the colour. The carbon used in the central lamps is very pure, and you see the light is perfectly white; this carbon in the third lamp in the stand gives a purple fringe to all shadows thrown by the light; the reason of this is, that impurities in it have decreased the resistance of the arc, consequently allowed it to become longer than it should be, a larger proportion of the light is given by the arc rays themselves than in the centre lamps, where the arc being extremely short, 90 per cent. of the light is given by the crater of the upper carbon.

This brings me to what I believe to be the true explanation of the superior fog-penetrating power of some electric lights over others. You will observe that the light of the electric arc comes from two sources; first, from the incandescent surfaces of the two carbons, that of the upper or positive one being cup or crater shaped, this crater affording 90 per cent. of the light, so long as the arc is short; to the first source must be added a little light from the glowing point of the lower carbon. The second source is from the arc rays proper; this light is not white but tends towards violet or purple; when the arc is long there is a greater preponderance of this coloured light.

Now, I believe that the fog-penetrating power of an electric light is in proportion to the light which proceeds from the crater and from the point of the lower carbon. I believe the highly refrangible rays of the arc itself have little or no fog-penetrating power. In order to get craters of large size and intense temperature, we must use currents of low tension and great quantity; high tension ones are comparatively useless. I have had considerable experience quite recently with electric lights during the continuance of heavy fogs at Glasgow, and my men have observed these facts, which I now lay before you.

I think that your present arrangement of using the electric light for discovering the approach of an enemy, say a torpedo-launch under cover of fog or smoke, is not a good one. You use the arc in a holophote placed down near the water-line. Now the holophote wastes a large proportion of the useful fog-penetrating crater radiance, and utilizes principally the arc rays. I should prefer to mount a large arc light at a great height above the water, and set back the upper carbon, so as to direct the crater in the direction required to be observed, with little or no aid from reflectors. I think the light given by an 80-Weber current, properly regulated, would give command of a circle 200 yards diameter even in thick fog. I think, also, the look-out man

ought to be placed considerably higher above the water-line than heretofore, although slightly below or to one side of the light itself, as it is evident that he should not look across or through the strongly illumined beam of fog.

I have now shown that we have at command a very complete and handy apparatus for producing the current, and for using it either in the small units of light, as in the Swan's lamps, or in the large arc lamps for lighting large spaces. I will not weary you with describing further the great improvements that have been made in all the accessories which the continued use of the light have caused us to provide. Although the statistics of cost do not greatly concern naval and military requirements, yet you will no doubt be glad to hear that there has been a steady onward march in cheapening the light, and whereas a year ago, no one would contract to supply large arc lights, such as I have shown you this evening, for less than a shilling an hour, the same can now be supplied at eightpence.

In comparing the cost with gas, wherever we have had large spaces to light we have beaten gas many-fold; and even in small spaces, by using the Swan lights, it appears that we have already halved the cost of gas.

At the Alexandra Palace, electric lights, costing four shillings an hour, take the place of 2,500 gas jets costing two pounds an hour. At Mr. Swan's lecture, at Newcastle, he used 160 cubic feet of gas per hour to drive a gas engine, and so work a Gramme machine, lighting the lecture hall with thirty of his lamps, whereas 230 feet of gas per hour was used in the ordinary sun-burner to give a very inferior degree of illumination: these figures speak for themselves. I could quote you many other cases, some showing greater and some less comparative economy; but it is evident that if the electric light were now produced on the same scale and with the same vast appliances as are used for producing gas, we should have a still larger margin of economy.

I will conclude my lecture with an imaginary scene of a disembarkation of a large army carried on at night. It may be often necessary, on account of a dangerous coast or signs of approaching bad weather, that this operation should be carried on with the utmost speed by night as by day. All the apparatus for producing the current would be retained on board the steam-ships; the conducting cables only need be passed on shore. Tripod stands to carry the lamps would be placed at convenient intervals along the beach. The whole arrangement for lighting a mile of foreshore could be got into position and the lights shown with less than an hour's work by squads of men properly trained in the use of the apparatus. The most difficult operations, such as landing guns and horses, will be as easily carried on by night as by day. If extreme celerity were needful, it is not absolutely necessary even to land the lights: the lanterns may be hung in such urgent cases from spars rigged out on the steam tenders or launches, the dynamo-machines being worked, as before, on board the large ships. A distance between these, *i.e.*, between the machines and the lights, may be as great as a mile without causing the cable to be unnecessarily

heavy. I have not dwelt on the advantages which the light gives for night-signalling, as they are sufficiently obvious; but this brings me to the third part of my lecture, which, although on a subject connected with electricity, is connected but remotely with the electric light, namely, the photophone of Professor Graham Bell.

Four years ago Professor Graham's Bell's researches culminated in the telephone—the sending of articulate speech by means of electricity. Since then, another series of brilliant experiments have had for their result an invention of perhaps equal importance—the photophone, sending sound or even articulate speech to a distance by means of a beam of light.

Graham Bell had been for years experimenting with selenium, that curious substance which has the property of varying its electrical resistance according to the intensity of a beam of light falling on its surface. At an early period it had occurred to Bell to utilize this property in signalling or recording the changes of the intensity of a beam of light even to distant stations; but he was baffled in carrying this out by the very irregular and almost unmanageable resistance of selenium in its simple state.

Bell, with whom throughout these experiments has been associated Mr. Sumner Tainter, then made an elaborate series of trials of various compound arrangements of selenium with other and better conducting substances. Their wish was to prepare what they termed a selenium cell, which would have a resistance far lower than simple selenium and yet retain all its sensitiveness to the action of the light. Almost at the same time Professor Adams, Willoughby Smith, Werner Siemens, Lord Rosse, Draper, Sale, and others were carrying out independent investigations of the properties of selenium. Werner Siemens produced a cell which was tolerably satisfactory, but Bell and Tainter found that by using discs alternately of mica and brass, the mica being slightly smaller than the brass, and the minute grooves formed on the built-up cylinder being filled with selenium, they had produced a cell the resistance of which varied from 300 ohms in the dark to 150 ohms in the light. At a somewhat earlier stage, Bell had proposed to use the telephone as a delicate test of the minute changes of current which it is necessary to take note of when investigating the changes in the resistance of selenium under the action of light, and in May, 1878, at a lecture at the Royal Institution, in Albemarle Street, he announced his belief that it would be possible, by means of a telephone, to hear a beam of light fall on a selenium cell, and thus bring acoustics to the aid of optics. From this point, the progress was rapid. A few days afterwards Willoughby Smith announced that the prophecy was fulfilled: he had heard a beam of light on a bar of selenium by means of a telephone in circuit with it.

The next step was to devise an arrangement by which a beam of light could be thrown into rapid and rhythmical vibration, and so produce a musical tone. This Bell and Tainter accomplished by a rapidly revolving shutter, which alternately covered and uncovered a slit through which a beam of light passed, thus interrupting the beam at regular intervals of time. When a beam of sunlight thus interrupted

was allowed to fall on a selenium cell, a loud musical tone was heard from a telephone in circuit with it, and thus the musical photophone became an accomplished fact. Hence, to cause the beam of light to vibrate in unison with the human voice was a trifling step. An elastic mirror was provided, made of either mica or very thin microscopic glass, silvered on the one face, to reflect the beam of light, and so placed that the voice could be directed against the back face. When spoken to, this mirror vibrates in exact unison with the voice, and the beam of light reflected from its front face also vibrates. By means, then, of this combination—first, the sunlight collected by a lens and thrown on the face of the vibrating mirror; second, after being reflected, the rays being rendered parallel by a lens, and thrown to a distant station; third, there to be condensed by a parabolic mirror on to the surface of the sensitive selenium cell; fourth, the ear applied to a telephone in circuit with the cell—the articulate speaking photophone also was accomplished.

Bell and Sumner Tainter conversed across a distance of 240 yards at Washington, the sole medium of communication being the vibrating beam of light. In Graham Bell's words, "On putting my "ear to the telephone I heard distinctly from the illuminated receiver, "'Mr. Bell, if you hear what I say, come to the window and wave your "'hat.'"

I have thus given you very briefly the history of this wonderful discovery. It is impossible without diagrams, and without putting the apparatus before you, to make this very interesting, but at the same time somewhat complicated matter, clear to a large audience.

The photophone in its present stage is a subject rather for the laboratory than the lecture room. I must thank you for the kind attention that you have paid to my lecture. I had intended to illustrate it much more completely by experiments and apparatus than I have done. In that part of it, as a manufacturer and engineer, I should have felt more at home than in the more descriptive portion of my lecture.

The very extraordinary stoppage of traffic caused by the snow storm has, in spite of the postponement of my lecture, prevented a great part of my apparatus reaching me in time, and this I beg you will excuse.

Captain CURTIS, R.N.: With reference to the position of the look-out man, I think instead of putting him at the mast-head, he would see much better slung over the ship's side, having the water's edge so as to give him a view nearly on a level with the horizon (commonly called sky-line). I think he should be under instead of above the light.

Mr. LIGGINS: I should like to make one suggestion; great complaint has been generally expressed, particularly by ladies, about the whiteness of the electric light and the death-like tint it sheds on faces; is there any practical objection why that whiteness should not be modified by slightly tinting the glass shade? The light would be far more useful and would be better approved of if it was of a more agreeable colour, for instance, either a slight pink or a slight yellow tint.

Mr. SPOTTISWOODE, President R.S.: I very gladly respond to the call of the Chairman, although the lecturer has, on this occasion, left me very little to add. He has described, in a very distinct manner, the progress and present position of the electric light, which certainly seems to have now arrived at a sufficient degree of efficiency to become practically useful. The lecturer has also described the various machines already in use for the production of the light; and it is quite clear that

although they differ in essential details of construction, and even also in efficiency, yet they are all sufficiently good for practical purposes. With regard to the more general adoption of the light, the great difficulty, as the lecturer has pointed out, lies in the lamp or burner. During the past year the whole subject has been differentiated in a manner not hitherto attempted, nor indeed required. Different kinds of lamps have been devised for different purposes; and it is through such differentiation that we may hope to see the light more generally used than it is at present. One class of light is wanted for large open-air spaces; another for large enclosed spaces, such as railway stations and public halls; a third kind for factories; and lastly, another kind for domestic purposes. For the first purpose, undoubtedly large centres of light are the great desideratum. In several of the thoroughfares of London, lights have been erected which have undoubtedly added very much to the illumination of our streets, though it may still be a question whether that is the form of electric light for the town illumination of the future. In some places, particularly the docks, Dr. Siemens has erected lights on a larger scale and of much greater elevation; and by their means he has effected a complete illumination of the area required. Not only have the spaces outside the several workshops been illuminated, but even the interior of such of the workshops as have partially glass roofs have received illumination after the fashion of daylight. It remains, however, to move still further in this direction, and I sincerely hope that before very long experiments on a still larger scale, with more powerful lights at a much greater elevation, will be tried. By this means it is hoped to obtain a greater abundance of diffused light by reflection from buildings and other solid objects, and by the scattering of rays of light from the small particles floating in the air; and to imitate much more closely than has yet been done, the action of the sun or daylight. For the illumination of workshops and houses, the all-important feature is steadiness; and everything that can be done in this direction is of paramount importance. I understand from Mr. Douglas, of the Trinity House, who has perhaps had the largest experience in observing the electric light, that it is not so much the intensity that injures the eye, as irregularity or flickering of the illumination; a consideration which gives the highest value to the quality of steadiness. In the case of a factory, of course we do not want one great light, but a variety of lights of more moderate extent, so as to illuminate the different portions. For this purpose, Mr. Crompton has, I think, succeeded beyond any others. As regards domestic purposes, we have here the very beautiful invention of Mr. Swan; he certainly is the first in the field so far as this country is concerned. With these lamps it will be worth while to sacrifice a considerable amount of illumination in order to get a light of this degree of moderation and steadiness for the interior of our buildings. There are, I believe, one or two other inventions for the same purpose already advanced; and I hope, without any disparagement to Mr. Swan's light, that we may see others come forward with other solutions of the problem of domestic lighting. I heartily wish to join my thanks with those of the audience to Mr. Crompton for his interesting lecture.

Mr. St. George Lane Fox: I believe that Mr. Edison, who, of course, is referred to in the beginning of the lecture, though he is an American, has really done a very great deal for this subject. He began a work, it is true, perhaps, rather got up, as it were, by speculators and gas people, but I think great credit is due to him for having stated from the very first that it was possible to introduce a system of electric lighting that could be so distributed and divided as to be available for household purposes. I think Mr. Edison was the first, and not Mr. Swan, to produce a practically useful lamp on the incandescent principle, with a filament of carbon in a vacuum. Mr. Edison's researches too in respect to the presence of occluded gases in metals and other substances, are exceedingly interesting and very sound and scientific in the manner he has carried them out. I think he has rendered very great service not only to the future of electric lighting, but also to science, by his investigations, and for this proper credit should be given to him, more especially as in the future he will be able to show, and I have no doubt he will show, that he was the first to succeed, and I think it is as well to recognise it at once. I say this entirely disinterestedly, because it is very much to my disadvantage that Mr. Edison should be first, as I have also claims in this direction. There is another point to which I may call

attention, and that has reference to the reason why more light is produced in the arc light for a given amount of power than it is in the small incandescent lamp. It was not, I think, quite right to say that this is due to the greater resistance in the arc light. That arc light has a resistance, probably one hundred times less than one of those small incandescent lights that you see above you. I fancy their resistance is about a hundred ohms, whereas the resistance of the arc light is not much more than one, or it may be, perhaps, two or three. The fact is you cannot get an arc light with a very high electrical resistance. The real reason for this difference there can be no doubt is that a greater amount of energy is expended in a smaller space in the case of the arc light than of the incandescent light. In the arc you have an immense concentration of force in a small space; the result is that the luminous radiation is far greater in proportion to the amount of energy expended. Again, I cannot agree with Mr. Crompton in saying that the arc light is very much cheaper than the incandescent light. The incandescent lights, as you see, have a very great advantage over the arc light, and I think they will ultimately have the advantage of economy. It is altogether another question to estimate the economy in point of horse-power required, or in point of the amount of money which one would have to pay for a given quantity of light. It is true that in an arc light the amount of energy required to produce a given amount of light is very small in proportion to that required for the incandescent light, but an arc light always requires a considerable amount of attention; and there can be only a few produced from one generating machine, therefore we want an increased expense in plant, besides a great expense is incurred in the carbons themselves. It is a fact that energy can be produced by the combustion of 1½ lb. of coal per horse-power per hour, that is a very good result which is now practically obtained, for there is a firm, in Greenock, prepared to supply engines with that guaranteed consumption. The cost of 1½ lb. of anthracite coal, the best coal for this purpose, is only $\frac{1}{10}$th of a penny, and, I think, on a very large scale other expenses would be found comparatively insignificant as compared with the expense of gas works. Fuel employed in producing the power would be the chief cost for these small lights. Such lamps as those will probably be produced before long at a cost of one shilling each; there is hardly any expense of material in them, and they take less than an hour to make. I might add that the energy required to produce one of these lights is very much less than the amount of energy required to produce that powerful arc light. I believe that the proportion of energy is as twelve to one; that, in fact, a good powerful electric arc will give twelve times as much light as the incandescent light for the same expenditure of energy. You can raise these filaments to a higher temperature, but it is not safe to do so, because the carbon will not endure it long, but for all practical purposes, if the temperature is kept down, the lamp is indestructible.

Captain Long, R.N.: I should like to ask if Mr. Crompton would supplement the information which he has already so kindly given us about fog, by some statement as to the distance at which he found at Glasgow he could see an object with tolerable distinctness from the lamps, and also whether it can be argued from the illumination of a place in a given fog by a given weak light, what would be the illumination of a place in the same fog at a greater distance by a light of much greater power.

Mr. Crompton: With regard to the question as to the look-out man being placed above or below the light, that is a point on which I will bow to the judgment of those who have been on the look-out themselves. But I have been in a very elevated position, looking after an electric light on a mast 80 or 90 feet high, and I certainly could distinguish objects best when I was high up. I could distinguish them by foreshortening them when I got off the ground glare. I do not know that the case is identically the same on the water as on land, but I am under the impression that one of the great causes why it is so difficult at present to see a torpedo-boat approaching when the look-out man is placed low, is that mentioned by Captain Curtis, when he said he wished to get his eye as near the horizon as possible. That is, of course, all right when you want to see one object relieved against the light behind; but, I conceive, if you want to clearly distinguish what an object is, the higher you get, and the more foreshortened the sight you can get of the object, the

easier are you able to distinguish the nature of it, whether a friend or an enemy, a torpedo-boat or a harmless craft.[1] Next, as regards the whiteness of the light. It is not fair to blame the light for being white. I do not think ladies would long object to the light if it were white. It is when it gets beyond white—blue and purple—then it is so objectionable. The light is never absolutely white; it is always on the yellow side, and so long as it remains on the yellow side it is all right. Yellow is a becoming colour to all our complexions; the most unbecoming colour you can use is pink. I have tried putting pink shades on the light, and it makes everybody look yellow; whereas if you put yellow shades to the light, it makes everybody look pink. I have yellow glass here; it stops a great deal of the light, but it prevents the light hurting your eyes. Of course, the objection to its use is, that a large proportion of light is wasted. First I should say, with regard to Mr. Spottiswoode's remarks, that he has really hit the pith of the matter when he says, that if we want a light with great economy we must use large lights—hang up young suns; we must hang up something that will supply the place of the sun, and Siemens certainly has done that to a great extent at the Albert Docks. But the suns to be useful must be suns with this large crater that I spoke of; and in order to get the full advantage of the crater, you must have your light at great elevation. It is no use hanging up small lights at a great height; you want lights with a current of low tension, but enormous quantity, and then you get those suns which have a high fog-penetrative power. In reply to Mr. Fox's remarks about Mr. Edison, I may say that he misunderstood me, if he thought I cast any slur upon Mr. Edison as an inventor. I did not. What I blamed Mr. Edison for, was allowing his name to be used as a lever.

The CHAIRMAN: Allow me to say that, in this theatre, we always endeavour to avoid, if possible, anything that looks like a question as to priority of invention. There is great difficulty in deciding the question, and I therefore wish to caution you against a rock which is sometimes ahead in these matters.

Mr. CROMPTON: Of course, the fact that Mr. Edison has been always put forward as the leader in electric light invention has, to use an American expression, "rose" people a good deal in England; but I will not say anything further about Mr. Edison. With regard to the comparative resistance of the carbons in the incandescent system and in the arc system, I think I am really at one with Mr. Fox. There is no doubt that the resistance of the arc must be much higher at any certain point, otherwise you could not get the higher temperature; but it is an extremely difficult matter to describe and put into language which thoroughly makes this point clear, and I am afraid my language is at fault in this case.[2] The resistance of that large light was, as he said, about 1 ohm, and the resistance of each of these incandescent lamps is, we will say, about 150 ohms. But, I repeat, how is it that we get that temperature if we have not an enormous resistance? and I think that over every portion of the crater of that arc there is enormous resistance at each point. I quite agree with Mr. Fox, that the great improvement which has taken place during the year has

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[1] This question of the most favourable position to place the look-out man to distinguish objects in thick weather by the aid of the electric or other artificial light, is a very interesting one, and deserves more space than can be here given for its answer. As far as my experience guides me, the position of the man may be varied through considerable limits, according to the density of the fog itself, the great point being that he should be able to look at the object to be observed from a point well outside the bright beam of light, in all cases retaining his advantages of foreshortening the object as much as possible.

[2] Probably the resistance of the electric arc is determined by the cross section, if I may use such a term, of the stream of particles of carbon which are passing across it. If these could be condensed into a solid wire connecting the electrodes, this would be exceedingly fine, and its proportionate resistance to the passage of the large current used with the arc would be just so much greater than the resistance of the filaments of carbon in Swan's lamps to the passage of their currents, as is the temperature of the former greater than that of the latter; possibly the difference is as great as 12 to 1.

been the introduction of this incandescent light. Of course, I, who have been using to a great extent the electric arc, like every shoemaker who sticks to his last and swears by it, still consider the electric arc is very good in its place. But I admit, as freely as anyone does, that those gentlemen who have brought forward the beautiful incandescent light are the greatest inventors of the year. With regard to the question about the area that can be lighted, when the weather is foggy or there is smoke hanging about, that is entirely a question of degree. I have a light giving a crater a quarter of an inch in diameter, with a 30-Weber current, raised 90 feet from the ground, in a goods yard at Glasgow, and on clear evenings you can read the labels on the good wagons about 220 yards away from the light. On the foggiest evenings we have in Glasgow you could only read those same labels about 40 yards away from the light; but I am perfectly sure if, instead of using a 30-Weber current, I had an 80-Weber current, as they have in use at Chatham and in the Navy, I should have been able, in a fog of the same thickness, to have read the labels at a distance of 200 yards. At all events, it is a purely comparative question; there may be fogs so thick that you cannot see anything; but, in the ordinary fog, I am certain that the large light would have enabled us to read at that distance. Fog, although it stops the light in one sense, is rather a help to the light in another, for it distributes it, and, as Mr. Spottiswoode has explained to you, the particles of fog reflect the light in various directions; they break it up; and the fog and steam in a large railway station, when the lights are hung high up, have by no means an unpleasant effect. We have a very nicely diffused light, and if the lights are tolerably powerful there is not much loss. I might have referred to the occluded gases, with regard to which it is said Mr. Edison has rendered such yeoman service. I can only say I brought forward Mr. Edison's name as having made trustworthy researches on occluded gases at a meeting of the Mechanical Engineers at Barrow-in-Furness, and my remarks were received with considerable derision, as his researches were not considered to have scientific value of that kind.

The CHAIRMAN: I am sure you will all agree with me that the most cordial thanks we can give are due to Mr. Crompton for his excellent lecture. The number of instruments he has brought forward show the trouble he must have taken to bring before us this most interesting subject. It is one of the subjects of the day and is evidently making great progress. On the Thames, the new Albert Dock is lighted by the electric light, and as far as I know the only difficulty has been so to screen the lights from the river itself, that while lighting the docks it should not dazzle the people who navigate the river. That has been accomplished, and I do trust the electric light may make still further progress. With regard to the few words our zealous Secretary was good enough to ask Mr. Crompton to give us with regard to the photophone, I trust that in another year we may have a full lecture upon that most interesting and remarkable instrument. I will now, in the name of the meeting, thank our lecturer for his very interesting lecture.

Monday Evening, January 24, 1881.

ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart., C.B., Vice-President, in the Chair.

SUGGESTIONS FOR IMPROVING ARTILLERY FIRE, COMBINED WITH AN EXPLANATION OF CAPTAIN SCOTT'S SYSTEM OF SIGHTING GUNS.

By Captain L. K. SCOTT, R.E., Instructor in Fortification, Royal Military College.

I HAVE the honour to bring to your notice this evening some suggestions for the improvement of artillery fire, consisting of a new system of sighting ordnance invented and proposed by me some seven or eight years ago for introduction into the Service, together with other suggestions not immediately connected with sighting.

In order to make the value of this system of sighting clear to your minds, I propose to begin my lecture by explaining the method of applying the rules for shooting with accuracy, when employing: 1. The rifle sights; 2. Service sights for ordnance; 3. The revolving and telescopic revolving sights proposed by me, and to compare the relative advantages of one set of rules with the other.

Before proceeding to explain the proposed system, I must crave the indulgence of those Artillery Officers who may be honouring me with their presence for trespassing on ground so essentially their own, and for entering into elementary details so familiar to themselves, yet necessary for the elucidation of my subject to the uninitiated; and I feel sure when they appreciate the advantages of the principles set before them, they will not only co-operate with me in my endeavours for the good of the Service, but they will be the first to hail with delight a system of sighting which not only simplifies the instruction to be imparted by them to their men, but increases enormously the destructive powers of their artillery.

To begin with the Martini-Henry rifle sights. In shooting the infantry soldier has to contend with four causes of error:—1. Drift; 2. Wind; 3. Sun; 4. Inclination of the sights. *Drift* is the deviation of the shot due to rifling. *Wind*, according to its direction, causes the bullet to be deflected from its course to the right, or to the left, or it increases or diminishes the range. *Sun* causes the firer to take a false "line of sight." *Inclination of the sights* causes the line of sight to be taken across the axis of the piece, and consequently the bullet to go on that side to which the sight is inclined, and short.

How are these four causes of error remedied by the *Infantry soldier?* 1 and 2. Drift and wind are obviated by using the wind gauge; 3. Sun by blackening the sights, and by care in aiming; 4. Inclination of the

sights. The error due to this cause is entirely under the control of the Infantry soldier, because he can ensure the verticality of his sights by turning the rifle round in his shoulder. Hence, theoretically speaking, the error due to inclined sights is completely eliminated by the Infantry soldier. It follows, therefore, that for him to shoot with accuracy, he must apply practically to his sights certain rules which embody the remedies for the errors in shooting explained above.

These rules are applied mechanically by the Infantry soldier in the following way:—1. Adjust the sight to the correct distance; 2. Keep the sights upright by turning the rifle round in the shoulder till they are vertical; 3. Take a correct line of sight, which will take into account "wind" and "drift." To get him to comprehend and to apply these apparently simple mechanical rules to his rifle, he must have much theoretical instruction and much practice in shooting. With a view to making the *Infantry* soldier efficient, he has at least 8 days' theoretical instruction, and fires 90 rounds yearly. Should, however, any man not become efficient with this amount of training, he is liable to have any further amount of theoretical instruction, and to fire another 90 rounds. *The Infantry soldier therefore fires at least 90 rounds per annum to make him efficient in the use of his rifle.*

I will now proceed to explain the theory of Artillery sights. The theoretical principles involved in sighting ordnance are similar to those involved in sighting rifles, but the rules required for the gunner to make accurate shooting are far more complicated, and far more difficult to understand and to apply, than the rules for aiming the rifle. The Gunner ought, therefore, to require far more theoretical instruction, and far more practice in shooting than the Infantry soldier to teach him to fire with accuracy. We shall see that he has far less. For accurate shooting the Gunner has to contend with 5 causes of error instead of 4:—1. Drift; 2. Wind; 3. Sun; 4. Having to aim at distant objects not clearly seen by the naked eye; 5. Inclination of the sights due to the gun-wheels not resting on a level platform.

How does the Gunner provide against these 5 causes of error? 1. *Drift* is partially obviated by fixing the tangent sight on the gun at the permanent mean angle for rifling with the vertical. 2. *Wind* is allowed for by the "deflection scale," which corresponds to the wind gauge in the rifle. 3. *Sun.* The effect of the sun has been diminished of late in the 13-pr. by employing an eye-hole instead of a notch in the tangent sight. Some provision to obviate this defect could and should be made. It is obviated in Scott's sights by the use of a telescope, and by covering the foresight with a tunnel as in the 13-pr. breech-loader. 4. *Having to aim at distant objects not clearly seen by the naked eye.* This defect is not so applicable to the Infantry soldier as it is to the Gunner, because the former fires at much shorter ranges than the Gunner. No provision is made for assisting the Gunner to aim at objects which are beyond the clear vision of the human eye, and consequently he fails to extract the best shooting qualities of the gun because he cannot see to aim at objects at distances equal to the range of the gun. *Hence a telescope is an absolute necessity.* 5. *Inclination of the sights.* With the Infantry soldier this defect is

remedied by his placing the sights into an upright position, which is accomplished by his turning the rifle round in the shoulder till they are vertical. This simple method of obviating the great errors due to the inclination of the sights, naturally cannot be carried out in the same manner by the Gunner, because he cannot twist his gun round in his shoulder.

This *Inclination of the sights* is a constant source of error and annoyance to the Gunner, because he has to make complicated calculations to remedy it, and is therefore a permanent defect in the present system of sighting. When he aims with a "line of sight" taken over inclined sights he no longer aims directly over the axis of the piece but across it. Hence he loses that command or control over the axis of the piece which is indispensable for accurate shooting, and which the infantry soldier possesses by having the power to turn his sights into a vertical position at will.

What then must the Gunner do to regain this command over the axis of the piece which he loses by his sights being inclined? He must calculate how much the notch of the tangent sight has been laterally removed from the vertical by the sight being inclined, and give this amount in "deflection right" or "left" to the notch of the tangent sight. Then if he apply this calculated correction to the tangent sight, he will regain, *according to the correctness of his calculation*, the command over the axis of the piece which he had lost by the inclination of the sights, because the notch is supposed to have been brought again back into the same position vertically over the axis, which it held when the sight was upright. A "line of sight" then taken over the notch and the tip of the foresight will enable the firer to direct the axis in any required direction.

How is this error due to inclined sights calculated in the field by the Gunner? Let us suppose, by way of example, that the range is 4,000 yards, gun-wheels resting on ground sloping to the *right*, and that a strong wind is blowing from the *right*: 1. No. 1 has first to find the elevation in degrees due to 4,000 yards range, say 9°, and to adjust his sight to 9°. 2. There is a strong wind blowing from the *right*, which will force the shot to the *left*. He must therefore counteract this effect of the wind by giving deflection, which he has to remember is "right deflection." How much right deflection is to be given? This can only be determined by those who have had great experience in actual practice in shooting. Suppose 10′ the correct amount of deflection, No. 1 gives 10′ "right deflection" to the notch of the tangent sight. 3. The *sights are inclined to the right*. The shot will therefore go to the *right* of the intended direction, and short. No. 1 must calculate the "deflection" required to counteract the error of the shot to the *right*, and then to remember that he is to give *left* and not right "deflection," otherwise the shot would go twice as much to the right as it would if no correction had been applied.

How does No. 1 calculate the required "deflection?" He uses Fitzroy's indicator, to find out how many inches the lower wheel is below the upper one, or he places the rammer on the upper wheel and over the lower one, holding it, as far as he can judge by the eye, in a

horizontal position. He then estimates the number of inches which the lower wheel is below the upper wheel, say 5 inches. He then applies the following rule:—"*Multiply the difference of level of the "wheels in inches by the angle of elevation for the right or left deflection.*" The angle of elevation for 4,000 yards is say 9°. Therefore $9 \times 5 = 45'$ left deflection. But there being a strong wind from the right, which will blow the shot in the opposite direction to that caused by the sight being inclined to the right, he has to remember that a correction of 10′ *right* deflection has to be subtracted from the 45′ *left* deflection already calculated to counteract the effect of inclined wheels. Therefore 45 left -10 right $= 35'$ left deflection as the correct "line of sight," under the above conditions. No. 1 then aims at the mark and the gun is fired.

If the correction has not been accurately made, the shot does not strike the mark, and consequently another calculation has to be made in the following manner: He guesses the distance to which the shot has fallen to the right or left of the mark, which say is 20 yards to the *right*. He then applies the following rule:—"Multiply the esti- "mated deviation in yards by 36 and divide by $\frac{1}{100}$ of the range." Therefore $\frac{20 \times 36}{40} = 18'$ deflection. No. 1 has then to remember that the 18′ deflection found must be *left* deflection, which must be added to the 35′ *left* deflection already given to the deflection scale of the tangent sight for "wind" and "inclination of the wheels." Therefore 35′ left $+18'$ left $= 53'$ left deflection is to be given to the sight. If this be found not to be correct, the same calculation will have to be re-made.

Unfortunately this correction will not ensure the mark being struck, because when a gun is fired on the natural surface of the ground another element of error creeps in after every round which *should be* but is never taken into account, viz., *the further inclination of the sights, from the lower wheel becoming more and more imbedded in the earth after each recoil.* These ever-varying alterations in the inclination of the sights after every round, however small they may be, necessitate for accurate fire the continual remaking of these mental calculations. Therefore the calculated and applied corrections for the first round from one gun are of very little use for a second round from the same gun, and unless the rules for calculating the corrections for each source of error as it crops up, be applied to each gun after every round, it will be *mechanically* impossible for the second shot with a field gun to strike the mark, even should the first have done so. Therefore, for absolutely accurate fire, if there be 100 rounds fired from 100 guns, 100 mental calculations will have to be made.

By referring to Major Ellis's table of shooting, it will be perceived that the "deflections" vary for every round fired; whereas in the table of the shooting in France at 5,100 yards, with the telescopic revolving sight, the "deflections" remain the same throughout for all the rounds, whatever may have been the inclination of the wheels. I would ask, is it likely that a man who is being fired at by the enemy can and will make those mental calculations on the spur of the

moment? I should say that this is highly problematical. Hence the futility of the present system of sighting.

From what has been said, it is evident that the rules necessary to enable the Gunner to shoot with *accuracy* with the service sights are far more complicated and far more difficult to apply in practice than those for the Infantry soldier.

The Gunner ought, for the above reason, to be more intelligent, more theoretically instructed, and more exercised in shooting than the Infantry soldier. For the Infantry soldier to learn to apply his simple rules for shooting, it is considered necessary that he should fire away at least 90 rounds per annum, and be constantly trained in theoretical instruction. It stands to reason, therefore, that the Gunner, whose rules for shooting are *infinitely* more complicated than those of the Infantry soldier, on account of not being able to place the gun-sights into an upright position, should have at least the same amount of rounds and the same amount of instruction as the Infantry soldier. As a matter of fact, the Gunner has very much less—only, I believe, 120 to 200 rounds per battery of six guns being allowed, or an average of 3 or 4 rounds per man of the 60 men required for working the guns, all of whom, in case of casualties, certainly ought to be able to shoot, one as well as the other. How can a Gunner possibly appreciate all the errors inherent in his system of sighting, or practically learn to apply the rules for their correction, by merely firing away 3 or 4 shots per annum? You might as well expect a man to become a good sportsman by his letting off a fowling-piece three or four times yearly.

In warfare, the sole object of firing off a rifle or gun is to kill some one each time that it is discharged. To perform its function it must be treated according to definite rules which, to be learnt, require a definite amount, and nothing less than this definite amount of practice. The definite amount, which of course varies with different individuals, should only be reached when perfection is attained.

Is not a system of Training illogical, unpractical, and incomplete, which assigns and apparently countenances different degrees of perfection for the Infantry, Cavalry, or Artillery, in the use of a weapon which has but one object, namely, *to kill?* It is an extraordinary anomaly that the Infantry man should fire 90 rounds yearly while the Cavalry man, who has the same kind of firearm, should only fire 40 rounds, and that 4 rounds are considered sufficient for the Gunner. It seems absurd that the Cavalry man or Gunner should not be expected to kill his man as often as the Infantry soldier—this being the obvious reason for firing off his weapon. It is treating a firearm as it were a toy, or merely as an addition to his uniform. Fixed bayonets and drill will not win a battle now-a-days against the rifle![1]

I have been told by Artillery Officers that their men do not have half enough instruction in "Laying" and "Aiming" guns, nor half enough practice in shooting. It is unfortunate that it should be so, but it cannot be helped. The duties of the Gunner are so multifarious,

[1] This has been lamentably and prominently brought to our notice by our reverse at the Majuba Hill since the delivery of this lecture.

and he has so many other things to learn besides, that he cannot devote more time than he does already to acquire a thorough knowledge of his system of sighting, *though it is the most important part of his training*; and again the State, on the score of expense, is not prepared to smooth his path by giving him sufficient opportunity of learning it practically by the expenditure of more than the regulation allowance of shot and shell.

What then can be done to make the Gunner more efficient in the "Laying" and "Aiming" of guns *without the expenditure of more shot and shell?* If we analyse the question, we can trace the cause of all his difficulties in "Laying" a gun to his *faulty system of sighting*, which does not permit of his placing his sights at will into an upright position, and to the *want of sufficient ammunition* for testing *practically* the result of his "laying."

The difficulty of "laying" guns can be obviated by giving him a system of sighting which will enable him to place his sights into an *upright position*, and the want of sufficient shot and shell for testing his "laying" may be supplemented by the introduction of a metal tube into the bore of the gun, which would allow of small size ammunition or even bullets being fired in combination with his drill previous to the annual practice of shot and shell.

The system of sighting invented by me, which I am about to describe, will not only remove all difficulty in "laying," but will enable the Gunner to become thoroughly efficient in shooting with no more than the present regulation amount of ammunition and training at his disposal.

I hope to be able to show by theory and by actual practical results, how, with a minimum of intelligence, with less instruction, with less expenditure of time and ammunition, with far less trouble to the Instructors and to themselves, Gunners can be made to extract the best shooting qualities of their guns, and to shoot as a whole about 10 times better in the field than they can at present with the service sights.

The system of sighting which I propose to bring to your notice consists in making sights for ordnance capable of revolution about an axis parallel in every direction to the axis of the gun.

This revolving movement may be created by automatic arrangement on the principle of the pendulum, with the centre of gravity of the system of sighting below the axis of revolution; or it may be created by mechanical adjustment with the centre of gravity of the system of sighting above the axis of revolution.

The object of my invention is—1. To dispense with the errors of fire due to the inclination of the service sights when the gun-wheels are not on the level, by making the sights (back or fore) capable of being turned back again into the same position with reference to the vertical which they occupied when the gun-wheels were on the level. 2. To enable the firer to correct errors in range and direction by mechanical adjustments, instead of by the present method of calculation. 3. To give the firer complete command over the axis of the piece under all conditions. 4. To simplify the instruction required

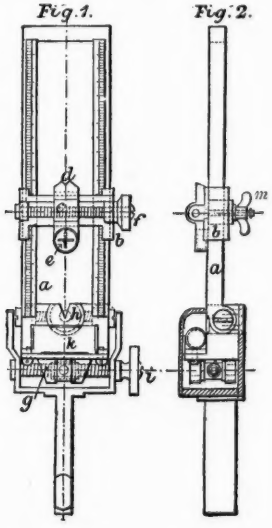
to be imparted to the Gunner for the use of the service sights, by converting mentally calculated arithmetical corrections for "deflection" into mechanical adjustment; and, finally, to dispense with all the defects and causes of error in shooting inherent in the present system of sighting.

The principle of my system of sighting consists in giving to sights a third movement in addition to the two movements already existing in the present system of sighting. The two movements of the present sights consist in a horizontal movement for giving "deflection," and in a vertical movement for giving the "angle of elevation." The additional third movement in my system of sighting consists in causing the two above-mentioned movements of the service sights combined, to revolve together about an axis parallel in every direction to the axis of the gun.

No sight without these three above-mentioned movements, involving as they do the theoretical principles necessary for a true sight for guns, will give the firer complete command over the axis of the piece.

I have therefore embodied these essential theoretical principles mechanically in sights for ordnance generally, and I designate sights made on these principles "Revolving sights;" and where a telescope is used to aid the vision "Telescopic Revolving sights."

Fig. 1. *Fig. 2.*



I will now proceed to describe how I have applied these principles mechanically in the example illustrated in the accompany drawing. Fig. 1 shows the front elevation of a revolving backsight fitting into the socket in the gun of the service sight together with the interior

construction of the same; Fig. 2, the side elevation of the same; Figs. 3 and 4, Plate I, the side and front elevations of a telescopic revolving sight. *a*, Fig. 1, is a hinged flap graduated for different ranges, and fitted with a slider (*b*) also graduated for "deflection," which can be set at the proper elevation on *a*; *c* is a traveller containing the notch *d* and eye-hole *e* of the backsight, which can be made to travel by the screw *f* for the purpose of giving the required "deflec-"tion." The flap *a*, Figs. 1 and 2, is hinged to an arm (*g*), both of which are made to revolve together round a hollow centre (*h*) by turning the screw (*i*), for the purpose of placing the sight into an upright position when the gun-wheels are not on the level. The hollow centre (*h*) and the levelling screw (*i*) are fixed to the frame; (*m*) is the clamping screw of the slider (*b*). The stem of the sight fits into the socket in the gun; (*k*) is a level to adjust the verticality of the sights, and is fixed on the sight in a position at right angles to the axis of the piece. The whole of the interior construction is covered up, leaving merely the bubble exposed to view.

To use the Revolving Sight.—For the sake of comparison let us take the same conditions which I have already taken in the example for illustrating the working of the service sights, and see how this is managed with the revolving sight. Range 4,000 yards; gun-wheels on ground sloping to the *right;* strong wind from the *right.*

Let us take for example a *battery* of artillery about to fire at an object:—1. Adjust the sliders to 9° elevation; 2. Give 10′ right "deflection" to counteract force of wind; 3. Level the sights to dispense with the inclination of the wheels; 4. Aim; 5. See that the bubbles be in the centre, if not bring them to the centre and correct the aims; 6. Fire one gun only, the Nos. 1 of the remaining five guns of the battery looking over their sights and watching for the point of impact of the shot from the gun that is fired. If this trial shot of No. 1 gun hit the mark, the shots of the remaining guns of the battery firing at the same range, will also go in the required direction. But if the shot do not strike but fall to the right of the mark, the Nos. 1 of the remaining five guns, who, as before explained, are watching for the point of impact, will at once move the traveller (*c*) of the slider (*b*) by means of the screw (*f*) to the left until the notch, the tip of the foresight, and the point of impact of the shot are in line. This operation corrects mechanically the error in direction of the shot, and shows at once the amount of deflection to be given. It is, therefore, only necessary to turn the guns laterally by means of the trails, and to aim at the object with this corrected "line of sight," and the shots will travel in the required direction.

Of course, the No. 1 of the gun which has fired the trial shot must borrow and apply to his sight this corrected "line of sight," so that when this gun is again fired all its succeeding shots will go in the required direction. Fig. 5 shows how the corrected "line of sight" is obtained by the deflection scale of the "revolving sights."

This very simple mechanical process[1] for finding the correct "line

[1] This is infinitely superior to the German method of finding the range by trial shots. They are supposed to require 12 shots to attain this end, whereas 1, or at

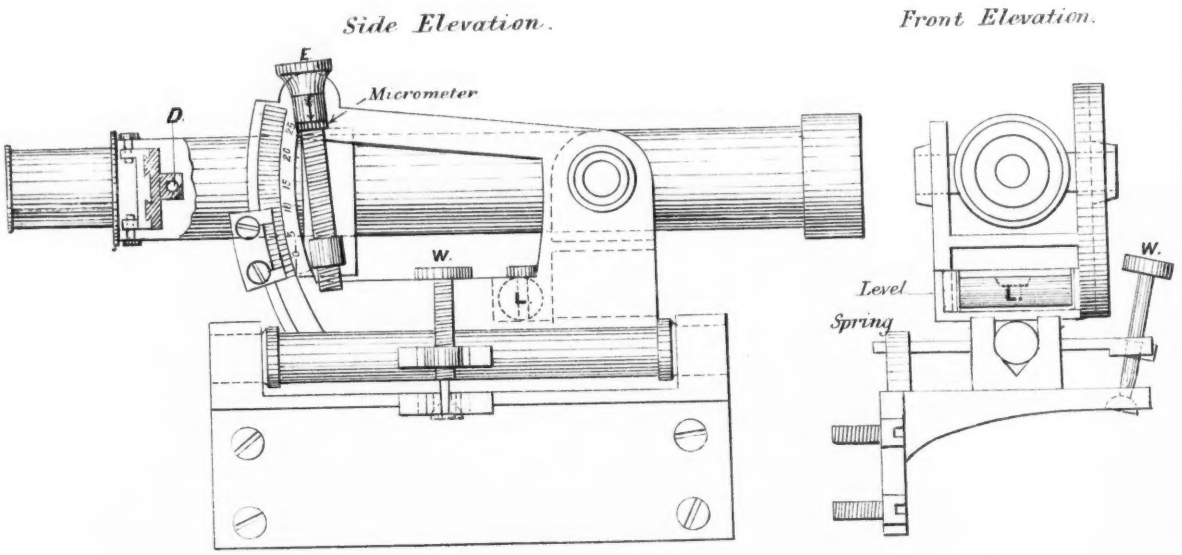


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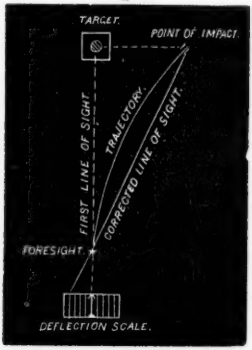
Diagram in plan explanatory of the process of correcting the "Line of Sight" of the Telescopic Revolving and the Simple Revolving Sight for the Error in Direction.

Fig 5.



"of sight," as compared with the complicated arithmetical method in use for the service sights, demands only sufficient intelligence on the part of the No. 1 to turn a screw in the right direction, and sufficient training to enable him to take a correct aim. In fact, after a few moments of practical instruction, any uneducated Hindoo, Japanese, or Chinaman who could aim, would be capable of performing the necessary operation just as readily as the most intelligent European, and the chances are that the result would be far more accurate than as at present obtained by calculation by the best trained soldier. This method, which allows of the correct "line of sight" being found for any number of guns by *one trial shot from one gun*, is an incalculable advantage, because after the correction has been once given to the sights, the rules to be applied by the Nos. 1 become reduced to the simple mechanical operations of 1, Levelling the sight; 2, of Aiming; and 3, of Firing; which will give accurate shooting whether the gun be on a perfectly level platform, in a ditch, or on the side of a hill, because the very fact of levelling the sight causes the gun to be fired from, as it were, a level platform.

This condition of things, therefore, gives to the No. 1 perfect command over the axis of the piece, which, with the service system of sighting, when the wheels are not on the level, he catches at in vain by mental calculations which are not applicable in practice. It also gives to the commander of artillery far greater control over his batteries, whose fire he can hurl at will with a constant unerring effect against an enemy, and, consequently, it makes him far less dependent on the intelligence of others for carrying out in action his own part of the programme to the best of his abilities, because it

most 2, are sufficient by the proposed method. The German battery would be annihilated during the interval of time which would elapse before the correct range was found.

transfers to himself the power over the shooting of his guns, which is now uncertain, inasmuch as it is in the hands of the Nos. 1, who have to make accurate calculations.

Now let us examine what causes of error in the service sights have been removed by the revolving sight. 1. Errors in shooting from *inclined sights* are dispensed with by placing the revolving sight into an upright position. 2. Errors due to "*wind*" and "*drift*" are corrected by the mechanical method of moving the deflection scale to one side until the notch of the backsight, the tip of the foresight, and point of impact of the shot are in line. 3. Errors from "*sun*" are dispensed with by covering the foresight with a tunnel, and by providing an eye-hole instead of the notch.

From the above we see that all the causes of error in shooting inherent in the service sights have been obviated by the revolving sight except one, viz., that one due to *not being able to see objects clearly at distances equal to the ranges of the gun.* To provide against this defect, I have added a telescope to the revolving sight, which, besides possessing other advantages, will enable the firer to see objects at the full ranges of the gun. This sight I designate the *Telescopic revolving sight.* It differs only in mechanical construction from the simple revolving sight just described. The principles on which it is constructed are similar and the rules applicable in the case of the revolving sight, for correcting the range and direction of the shot, are equally applicable in using the *Telescopic* revolving sight.

In this Telescopic sight we have, then, an instrument theoretically and practically fulfilling the conditions of a true sight for guns, which will enable the firer to utilize the best shooting qualities of the gun, and to produce those qualities at critical moments when called upon to do so, because the excellence of the shooting does not depend upon the coolness and intelligence of the firer for making mental calculations, but upon *mechanical adjustment*, in which there is very little to learn, and, consequently, very little to forget.

The Telescopic revolving sight, *see* Plate I. The Telescopic sight is merely a revolving sight, with the deflection scale enveloped in a telescope. The angle of elevation is given by depressing the telescope by means of the screw, E, through the required number of degrees read on a vertical arc. The screw, E, is a micrometer headed slow-motion screw, reading to two minutes. This micrometer arrangement dispenses with the difficulty of reading a vernier. Inside the telescope there are cross wires, by which the line of sight is taken. These cross wires are fixed to a sliding diaphragm, which can be displaced to either side for giving "right" or "left" deflection.

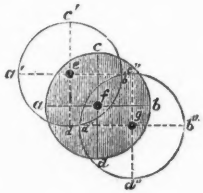
The telescope is supported by two supports, one of which is the vertical arc. These supports are attached to the axis of revolution of the sight, which I call the trunnions of the sight; a cross level is fixed at right angles to this axis to regulate the verticality of the sight. From this axis project on either side two projections, one for holding the levelling screw (W), the other for placing under a spring which is fixed to the bracket. The hemisphere at the end of the screw (D) fits into a cup on the underside of the bracket. When

the cup is in its place, the sight can be levelled by turning the screw (W). The bracket which is rigidly fixed to any part of the gun contains two grooves cut parallel to the axis of the piece into which the trunnions of the sight are placed.

The introduction of Telescopic revolving sights, constructed on sound principles, gives one new ideas and a new interest in artillery fire, and develops an entirely new and simple system of "laying" guns. With the Telescopic revolving sight the error of the shot in direction is corrected in the same manner as in the case of the revolving sight, by traversing the cross wires (answering to the notch of the deflection scale) till they correspond with the point of impact. This process also corrects the error in *range*.

In order that the error in range may be rectified by the above method, the point of impact should be observed and corrected by a man looking through[1] another telescopic sight, from another gun alongside similarly adjusted for "elevation deflection," and aimed on the same mark as the one on the gun about to fire the trial shot.

Example.—Suppose a battery of six guns is required to silence in detail by salvoes, batteries of the enemy coming into position at a range of 3,000 yards:—The Nos. 1 of each gun must aim with the same "elevation" at the same gun of the enemy's batteries, and in order to check the accuracy of the estimated range, No. 1 of No. 1 gun only will fire, the remaining Nos. 1 must each look through their telescopes to observe the point of impact of the trial shot. (See diagram.)



Let *ab* and *cd* in the diagram represent the horizontal and vertical wires in the "fields" of the telescopes. 1. If the shot fall anywhere above *ab* as at *e*, the Nos. 1 will know that the shot has fallen long and to the left of the object aimed at, and that the intersection of the wires *ab* and *cd* is to be brought into the dotted position *a'b'* and *c'd'* covering *e*, first of all by moving the telescopes *vertically* by the screw (E) to correct the "elevation," and secondly the cross wires horizontally by screw (D) to correct the deflection. After this operation the above-mentioned screws, for elevation and deflection, (E) and (D) must on no account be touched, but the aim in every case must be readjusted on to the target or object to be hit, by means of the elevating screw of the gun and by a lateral movement of the

[1] This has hitherto been invariably successfully performed by running the gun up again and by using only one Telescopic sight.

trail. The corrected elevation and deflection registered on the "vertical arcs" and "deflection scales" of the other guns must be applied to the sight of the gun which has fired the first shot.

Then to obtain accurate fire, the Officers will only have to see to the carrying out by Nos. 1 of the simple mechanical rule of "Levelling "the sight" before "aiming" and "firing," and they will, consequently, be in a position to devote their time to the watching of the effect of the firing and to the manœuvring of their batteries, instead of making calculations which ought but cannot be made by the men. 2. If the shot fall below *ab* as at *g*, the shot will have fallen short and to the right of the mark, and the same rectification for range and direction as above described will be required, as shown by the position of the wires *a''b''* and *c''d''*. 3. If the shot fall at the intersection of *ab* and *cd* as at *f*, the shot will have hit the mark and no correction will be required to be made.

The power of being able without mental calculations to correct mechanically the error in range of a shot, in addition to the error in direction, gives great value to this system of sighting, and renders the instrument, in addition to all its other advantages of accuracy and simplicity, equivalent to a range-finder.

It is obvious that it is of no consequence whatever for the firer to know the exact number of yards that the shot has gone over or under the mark, provided he can adjust his sight, by mechanical means, so as to hit that mark. If the shot do not fall at the intersection of the cross wires in the "field" of the telescope, it suffices for him to know that he has missed the mark, and that he must direct the cross wires on the point of impact to correct his "line of sight."

By a simple arrangement the instrument could be used to find the range, and the resulting range could be applied to the "sights;" but it by no means follows that a gun fired with the proper elevation for the range thus obtained, will hit the mark with the same certainty as when the correct "elevation" and "deflection" has been obtained by the above described mechanical method, which takes into account simultaneously, without any mental calculations, all extraneous deflecting causes at the time of firing, whether they arise from the varying force of the wind, the inequality of the powder, or the inclination of the "sights" from uneven platform.

If the enemy's battery were on level ground, or on ground sloping away from the position of your gun, the application of the above method for correcting the error in range would be difficult; but, *as a matter of fact, batteries of artillery would necessarily be in commanding positions with ground sloping to their fronts*, therefore this method could be carried out in the field just as well as in coast batteries in elevated positions above the sea.

Now let us see how this revolving system of sighting has stood the test of a trial by those who would have to use it on service. The revolving sights have only been tried twice on service conditions by batteries of artillery, and in both cases, in my opinion, the result has been exceedingly satisfactory. The first trial was made with the revolving sight at Okehampton in August, 1879. One was fitted to a

new 13-pr. gun of Major Stuart Nicholson's 13-pr. battery under trial. I was present at the trial.

Major Nicholson very kindly put the ten men who were to fire the competitive practice for prizes with it at my disposal for instruction. I gave them about thirty minutes' instruction, and asked Major Nicholson to allow these ten men each to fire one shot before commencing the competitive practice, to which he at once acceded.

The target was placed at 900 yards. The first man of the ten who were about to fire, adjusted the sight to the proper elevation and levelled it in the gun. The gun was fired, the point of impact was to the right. The next man, who had noted the point of impact, was directed to correct his line of sight mechanically by the prescribed method of moving the deflection scale laterally, till the notch of backsight and tip of foresight and point of impact were in line. This man then turned the gun on to the target, aimed with this corrected line of sight, levelled the sight and fired. The shot struck the target. Then each of the remaining eight men fired his shot in succession without altering the elevation or deflection, but taking care to level the sight before aiming, because the wheels were on very rough ground. The ten men were then taken over by an Officer of the battery, and they completed the whole of the competitive practice, consisting of four rounds each, without doing anything to the sight but levelling it.

The following are the results copied from Major Nicholson's paper in the "Royal Artillery Institute Proceedings":—

Target, 6′ × 6′. Range, 900 yards.

Bull's eyes	7
Direct hits	23
Ricochets	2
Misses	8
Total	40

(Gun-wheels were never in the same position.)

"One miss was due to projectile having jammed in the bore. The "remainder, with two exceptions, were due to very small errors right "or left. Their elevation was correct."

These results appear to me to be very satisfactory, and the sights were much appreciated by the non-commissioned officers and men of the battery.

From what I could gather from Major Nicholson on the ground, he was of opinion that the accuracy of the fire was very remarkable, and that for facility in teaching the men, for quickness in working, and for accuracy, this revolving system was infinitely superior to the present one, and that it should receive every encouragement. I will now read you the opinion of Major Nicholson's Lieutenant, who used the sight himself:—

Extracts from a letter of Lieutenant CAMPBELL, *Royal Horse Artillery*, to Captain SCOTT, *R.E.*

On the last day of our practice there, your sight was used on one of the guns of my division, and I personally superintended the "laying," and found that the men who successively acted as Nos. 1 at the gun were able to use the sight intelligently and accurately. The ground was *very* uneven, and rarely, if ever, was the level of the wheels the same for two successive rounds, so your system was thoroughly tried, and I have no hesitation in saying that it is (*where extreme accuracy of fire is desired, and rapidity is essential*) a most undoubted advantage to be able to arrange *mechanically* for the "deflection" to be given for a difference in level of the wheels, without calculation, and with a certainty of giving the required "deflection," in the RIGHT DIRECTION; for I have frequently found that, through *inadvertence*, a gunner, who can work out the necessary mathematical calculations *correctly*, will spoil the whole thing by putting the "deflection" in the wrong direction, thus *increasing* the error, instead of doing away with it.

Under similar conditions the gun can be laid with your sight much more rapidly and with much more certainty of accuracy than with the service sights.

I may mention that *seven* different men of the detachment took the part of No. 1 on the day in question, some of them gunners of very ordinary intelligence and with no *previous* knowledge of the use of your sight, and they seemed to understand it very readily, and to find it a great boon not to have to make any calculations about "level of wheels."

Personally I found your form of sight (fore and hind) more easy to "lay" with than with the sights issued to us with the 13-pr. gun. With the latter I found a great "blurr" on the hind-sight, when trying to "lay" accurately on an indistinct object, like a gun-pit; but I did not experience this with yours. Another advantage which I consider your sights to have over the service or experimental sights, which we have at present, is that (when firing at a fixed range, having once raised the sight to the required elevation) it is not necessary to touch the sliding bar again as long as the range is the same, because the sight is lifted intact from the socket before each round, and has merely to be dropped into its place again after firing, when it is at once ready to be "levelled" and "laid."

I tried your plan for correcting the error in direction due to deviation or other causes apart from the matter of "wheels," and I found that at the second shot I got the correct "line." The range in this case was over 3,000 yards.

As we only had your sight about three days I cannot claim to be able to point out *all* its merits or defects; but *I think if introduced into the Service, it will be welcomed by every one who wishes to see good shooting made by the "rank and file,"* who cannot be expected to be intelligent mathematicians.

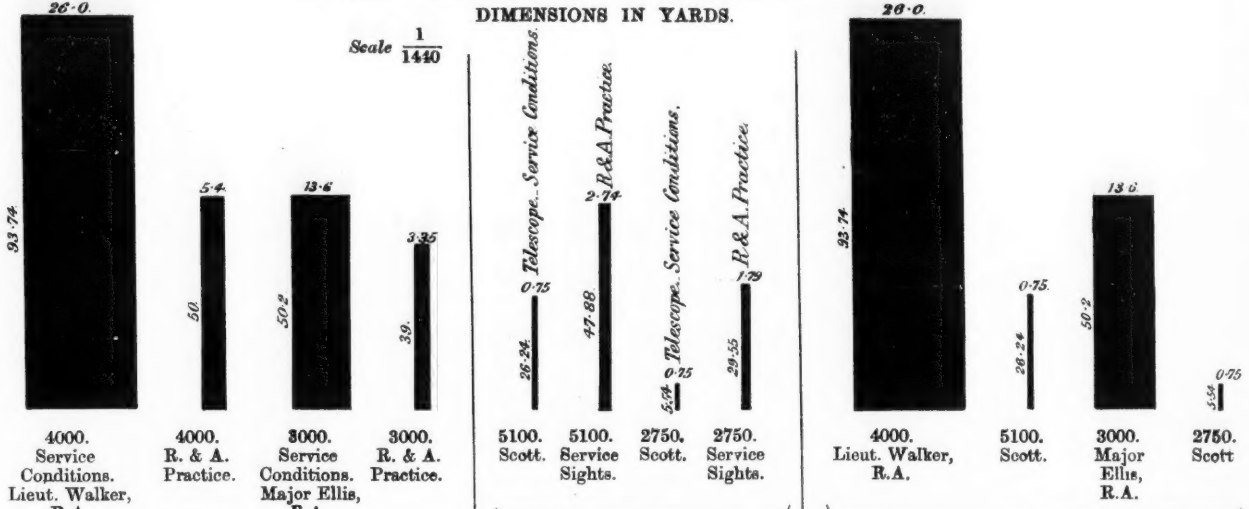
The advantage of this Revolving System was particularly impressed upon my mind on one occasion when I was watching a battery of five guns firing at some gun-pits. The Officers were superintending the practice and supplying the Nos. 1 with the elevation and deflection they thought necessary for the range. Nineteen or twenty shots were fired. One gun I think hit the mark twice, but none of the others hit it at all. Now, if all the guns had been sighted with the revolving sight, the elevation and deflection of the gun which had hit the gun-pit could have been at once borrowed from that gun and applied to all the sights of the other guns, and the result would have been that they would all have hit the gun-pits.

This, of course, could not be done with the service sights, because the gun-wheels were resting on rough ground, and consequently all the sights were inclined at different angles of inclination—some to the right, others to the left; whereas, with the revolving system of sight-

COMPARATIVE RECTANGLES WITH SCOTT'S SIGHTS, AND SERVICE SIGHTS, INTO WHICH 50 PER CENT. OF THE SHOT SHOULD FALL.

DIMENSIONS IN YARDS.

Scale $\frac{1}{1440}$



4000. Service Conditions. Lieut. Walker, R.A. | 4000. R. & A. Practice. | 3000. Service Conditions. Major Ellis, R.A. | 3000. R. & A. Practice.

Comparison of Shooting with Service Sights on "Service Conditions" with "Range and Accuracy" Practice. with Service Sights.

5100. Scott. | 5100. Service Sights. | 2750. Scott. | 2750. Service Sights.

Comparison of Shooting on "Service Conditions" with Scott's Sights, and with R. and A. Practice with Service Sights.

4000. Lieut. Walker, R.A. | 5100. Scott. | 3000. Major Ellis, R.A. | 2750. Scott

Comparison of Shooting on "Service Conditions" between Scott's and Service Sights.

Harrison & Sons Lith. S. Martins Lane W.C

ing, all the guns would be fired from, as it were, a *level platform*, whatever might be the inequalities of the ground. By this circumstance the Officers can attend to their other duties, and can have the firing of their batteries carried out with certainty and regularity by salvoes, which plan of firing affords the following advantages: 1. *That the enemy's batteries can be annihilated before they have time to change their positions.* 2. *That owing to the dispersion of the smoke the view to the front will not be obstructed by the smoke of guns fired independently.* 3. *That the disturbance of the aim which might take place in guns fired one after the other from the concussion is obviated.* 4. *That the commander of the battery has greater command over his fire.* 5. *That it prevents independent, unaimed, and random fire.*

Since this trial, the revolving sight has been fitted to only one of the new 13-pr. breech-loaders for further experiment. The merits of this system of sighting would be far better appreciated if all the guns of a battery, instead of only one, were fitted with these sights, because then an opportunity of realizing the working of the system would be afforded; and, moreover, a comparison could be made of the annual practice of such a battery with that of previous years of other batteries sighted with the service sights.

The second trial was made in France with the *Telescopic* Revolving sight in July, 1880.

Tables I and II, pp. 119 and 120, show the results of the practice from which I have calculated the rectangles into which 50 per cent. of the shot would fall, and I have compared these—1st, with the "range and accuracy" rectangles of the 13-pr. in Table III; and, 2ndly, in Table V, Plate II, with the rectangles on service conditions made with the service sights and 16-pr. by Lieut. Walker, R.A., and by Major Ellis, R.A., at 4,000 and 3,000 yards respectively, by which it will be seen that R. and A. practice is at least three times better than practice on "service conditions."

Before examining these rectangles it is necessary to grasp thoroughly the difference between "range and accuracy" practice and practice on "service conditions."

Range and accuracy practice is to test the shooting powers of a gun. It is carried on in the following manner:—A calm day is selected, the charges are carefully mixed and weighed, the gun-wheels rest on a perfectly level platform, an expert aims the gun at a fixed mark which can be distinctly seen, and which serves as the point of aim for all the distances at which the gun may be fired. In this manner series of ten rounds are fired with varying degrees of elevation, which are given by the quadrant. The several groups of shots thus formed on the ground are then carefully measured and transferred to paper, from which the rectangles are calculated into which 50 per cent. of the shot would fall.

The rectangle on service conditions represents the shooting of the gun under very different conditions to those just described. An ordinary gunner lays the gun, the wind is blowing, the charges are not all carefully mixed and weighed, the gun-wheels are inclined at all sorts of angles, and mental calculations for correcting errors in

shooting have to be made. Under these circumstances it is not surprising that shooting under "service conditions" must be vastly inferior to "range and accuracy" practice.

On comparing the shooting of Major Ellis and Lieutenant Walker on "service conditions" (which would be above the average shooting), with "Range and Accuracy practice," Table IV, Plate II, it is not exaggerating to assume that "Range and Accuracy practice" is 3 times better than practice on Service conditions."

On this supposition let us examine the various rectangles from the French practice for 5,100 yards and 2,750 yards, shown in the Tables I and II, and draw a comparison between them and the Range and Accuracy practice of the new 13-pr. muzzle-loader.

Taking from Table I the twelve shots which were fired with the same elevation and deflection, viz., 12° 30′ and 20′ respectively.

$$\frac{\text{The Scott rectangle with telescope}}{\text{13-pr. Range and Accuracy}} = \frac{13 \times \cdot 37}{23 \cdot 94 \times 1 \cdot 37} = \frac{1}{6 \cdot 8}.$$

But the Scott rectangle is deduced from shooting which was really on *exaggerated* "Service conditions," and not on the perfect conditions of Range and Accuracy described above, because for several rounds the wheels were abnormally inclined to test the accuracy of the principle of the sight, and there was a strong wind. Hence the Scott rectangle on *service conditions* is 6·8 times better than the Range and Accuracy practice of the 13-pr., and since it has been proved by Table IV, Plate II, that Range and Accuracy practice is 3 times better than the ordinary shooting in the field, it is clear that

$$\frac{\text{Scott rectangle on Service conditions at 5,100 yards}}{\text{Service sight R. and A. practice at 5,100 yards} \times 3} = \frac{1}{3 \times 6 \cdot 8} = \frac{1}{20 \cdot 4}.$$

Again, in Table II, if six shots, with the same elevation of 5° 14′ for 2,750 yards, be taken, and the rectangle calculated,

$$\frac{\text{Scott rectangle}}{\text{Service sight Range and Accuracy practice}} = \frac{1 \cdot 61 \times \cdot 304}{14 \cdot 775 \times \cdot 895} = \frac{1}{27}.$$

But these shots were fired on service conditions, for the gun-wheels were inclined 10°, and the gun was aimed by different men. Therefore, if the same reasoning be applied as above,

$$\frac{\text{Scott rectangle on Service conditions}}{\text{Service sight Range and Accuracy practice} \times 3} = \frac{1}{27 \times 3} = \frac{1}{81}.$$

In the French trial the Committee compared the rectangle calculated from eleven shots out of twelve (leaving out the first) with their range and accuracy practice for the 95-mm. gun, which makes

$$\frac{\text{Scott rectangle}}{\text{French rectangle Range and Accuracy practice}} = \frac{5 \cdot 5 \times \cdot 75}{24 \cdot 2 \times 3 \cdot 16} = \frac{1}{17}.$$

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But the Scott rectangle being on service conditions, the proportions should be $\frac{1}{3\times17}=\frac{1}{51}$.

Comparing the Scott rectangle of eleven shots with the 13-pr. "Range and Accuracy" practice,

$$\frac{\text{Scott rectangle at 2,750 yards}}{\text{Service sight Range and Accuracy rectangle}}=\frac{1}{12\cdot8},$$

but the Scott rectangle being on service conditions, the proportion should be $\frac{1}{3\times12\cdot8}=\frac{1}{38}$.

On examination of the tables, the Telescopic sight is found to be so true that 1′ more or less in elevation is rendered apparent by an increase or diminution in the range. Tables III and V, Plate II, show, by the size of the rectangles (which are all to the same scale, and which are calculated to contain 50 per cent. of the shots fired), very clearly the advantage in shooting possessed by the telescopic revolving sight over that by the service sights.

No matter in what way the Tables I and II are examined and treated, the only conclusion to be deduced is that much better shooting can be obtained by the use of a Telescopic Revolving Sight than by that of the ordinary service sights.

But there is one point which, to my mind, outweighs all the rest in importance, and which is not sufficiently taken into account by those who have to decide upon the value of this system of sighting, viz., the little training which is required to use these sights as compared with the amount of instruction to get over the intricacies of the service sights. This great improvement in shooting is obtainable by any man of the meanest intellect, provided he can take a correct aim, because all the mentally-calculated deflections necessary to be made for the Service Sights, by intelligent men, are entirely obviated by the *mechanical* adjustments of the Revolving Sight, the application of which can be learnt in the shortest time. It is urged by some that sights without telescopes, merely aided by the use of a binocular, are sufficient, but, as the aim has to be actually taken by sights without a telescope, the object which has been previously clearly seen by the binocular is lost to view again when the aim is taken. It is equivalent to expecting a man to see a mark *without* a telescope which can only he seen *with* a telescope.

The following are the conclusions and opinions of the French Committee who tried the Telescopic sights:—

1. That the instrument experimented with is an instrument of exact aim.
2. By its use the firer can aim accurately at distances equal to the range of the gun.
3. He can aim and fire at objects invisible to the naked eye.
4. He can always direct the cross wires on the same point of the mark, and consequently always take the same aim.
5. A shot having been fired, he can judge of its effect whilst aiming the following shot.

6. He has in no case to trouble himself with the inclination of the wheels, and consequently always fires as if the wheels were on a horizontal platform.

7. With a little practice, when once the angle of elevation and deflection shall have been given, no matter what man, will be able to aim in all weathers *more rapidly than with the service sight.*

The Committee consider, therefore, that it would be advisable to adopt this new system of sighting for the new guns.

That it would be expedient that all field guns should be fitted with a bracket necessary for the telescopic sight.

That two of these telescopic sights should be in the box of instruments, and that a certain number of non-commissioned officers should be instructed in their use, as they are in that of the range-finder.

The Committee in conclusion consider it their duty to lay stress on the splendid results which have been obtained, and to call special attention to the fact, that Scott's telescopic sight solves completely and practically the problem of a telescopic sight; and that its adoption by an artillery will give to that arm a very considerable advantage if it has to engage an artillery unprovided with an analogous system.

Persons who are unacquainted with the principle of these revolving sights imagine that I consider the telescope the chief advantage of these sights, whereas the telescope is a minor detail as compared with the principles mechanically embodied in these sights, which permit of the corrections for errors in range and direction being made by mechanical adjustment, instead of, as heretofore, by calculations. A telescope is needed when the object cannot be clearly seen by the naked eye.

There are, however, other and very important advantages in the telescope:—

1. *The "line of sight," being contained in the telescope, needs no foresight;* 2. *The cross wires ensure the same aim being taken by every man, which consequently eliminates the variable personal error of each No.* 1; 3. *A short-sighted man can see to aim as well as a long-sighted man.*

No. 1 advantage allows of the telescope being fitted to any part of the gun most convenient. For instance, on the breech, trunnion, or even muzzle of the gun. This latter position for a telescope, if covered by a shield, would allow of a direct aim being taken over a parapet, at an object, with very little danger to No. 1.

Under all circumstances, the most accurate and only trustworthy method of laying a gun is by a direct line of sight on the object. This can be well done by the aid of shields and telescopic sights.

The telescopic sight would be advantageously employed if fitted to the muzzle of the gun, together with a shield to cover the opening, for firing out of casemates or out of narrow openings, such as would be required for aiming a gun through an armoured gun carriage, through the front of which the muzzle only of the gun would show, and which would also recoil with the gun. Such an arrangement appears to me to be more simple and practical than the overbank carriage.

The telescope is, also, an absolute necessity for firing at high angles where the tangent sights become exceedingly long and inaccurate, such as in howitzers.

There are many useful applications of the telescopic sight which I

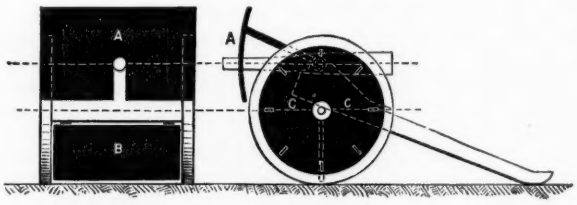
have not time to mention, and probably many more, of which I am ignorant. but which, no doubt, would be developed by others, who would take an intelligent interest in its use, and who had opportunities afforded them, which I have not, of studying it by actual practice.

I think it would prove invaluable as a scientific instrument to an experimental Committee, because it affords, by its great accuracy, the means of making researches into the mysteries of gunnery, by which one could assign, with absolute certainty, to the whole deviation of a shot the proper share of each of the causes which may have deflected it, or caused it to fall long or short. These causes are: 1. *Incorrect aim;* 2. *Drift;* 3. *Inclination of the wheels;* 4. *Wind;* 5. *Inequality of the powder.*

We have lately heard a good deal about long-range fire with rifles, but I think that the fire of a Nordenfeldt gun, aimed with a telescopic sight, would prove far more effective at long ranges than that of several rifles, each aimed, or rather not aimed at all, by different men. By a simple arrangement the telescopic sight can be used as a range-finder. It can also be used for firing at night, and for judging and regulating the bursting of fuzes above plane.

I have shown how artillery fire may be improved by the use of proper sights; but there are other means of not only improving the fire, but the fighting power of the gun, viz., *by the introduction of shields.* These were proposed by Colonel C. B. Brackenbury, R.A., but I believe not as a part of the gun. Major Stuart Nicholson, R.H.A., has lately made several suggestions on this subject; one was the very practical suggestion of plating the lids of the boxes on the axletree of the gun carriage, and of utilizing them as shields. Captain Walford, R.A., has also suggested the most excellent idea of steel plating instead of spokes for the wheels. I myself suggest shields as shown in the sketch, or on the principle of the Japanese umbrella, the gun acting as the stick. The former arrangement presupposes the steel plate

Shields for Field Guns. Scale $\frac{1}{12}$.



A. Shield $\frac{2}{16}$" thick $6' \times 3' = 90$lbs.
B. Shield $\frac{3}{16}$" „ $5' \times 2' = 50$lbs.
} = 140 lbs.
C.C. Steel plate centre instead of spokes for wheels.

instead of spokes for the wheels, and consists of two shields $\frac{2}{16}$" thick, weighing 5 to 6 lbs. per square foot. The upper one $6' \times 1\frac{1}{2}'$ rests on the gun just in front of the wheels which form a backing. It is

attached to the trunnions of the gun by two arms, and perforated with a hole through which the muzzle passes. The lower one is a steel plate $5' \times 2'$ hinged to the underneath of the axletree. The two together complete would not weigh more than $1\frac{1}{2}$ cwt., which is the weight which can be carried by one mule. This extra weight would be considered perhaps at first by artillerists sufficient reason for condemning them at once as affecting too much the mobility of their guns, but when we consider that the selected position for artillery would not be constantly changed, that a man would take infinitely better aim behind a shield, and that guns could be fought at closer ranges with comparative safety from rifle bullets, it behoves us to give the subject serious consideration.[1]

From what has been said, it has been proved in my humble opinion, and others will come to the same conclusion if they will take the trouble to master the gist of the proposed system, that any gun on "service conditions" with these Telescopic and Revolving Sights will shoot, *without any calculations* whatever, at short ranges two and a half times better, and at long ranges six or seven times better, than with the service sights *with calculations*. Hence, these improvements when applied to a gun, are equivalent to the production of a gun three times more accurate than any gun of the present day for a maximum cost of about 6*l*. per gun, which, when compared with the price of a gun and of a single shot, is very small indeed.

Few persons realize what the cost of a shot is. They have an idea that it ends with its manufacturing price in the arsenal. It only begins then. There is first to be considered the price of the powder, then that of the shot, then the cost of ammunition wagons, of horses, of men necessary for transporting gun, powder, and shot to the place of action. To all this must also be added a certain proportion of the cost of the gun itself. Thus, if a gun has cost 10,000*l*., and if 1,000 rounds can be fired from it before becoming unserviceable, each round would cost $£\frac{10000}{1000} = £10$ worth of the life of the piece.

Even if the proposed sights were to make the gun shoot *without* calculations only as well as the present sights *with* calculations, the very fact of doing away with those unpractical calculations ought to suffice for the introduction of such a system. The present system of sighting is as much behind the revolving system as the smooth-bore is behind the rifle. It neither does justice to the rifled gun nor to the firer. Practically speaking, the present sights are in about the same state as when they were invented by Robins 120 years ago. Perhaps they were quite good enough, because the old smooth-bore guns of that time were extremely imperfect in their shooting, whilst their longest effective ranges were what we should now consider almost close quarters.

A gun sighted with a system of sighting which will only allow of its being fired with accuracy when the wheels are resting on a

[1] Since writing these remarks, the necessity for improved training in shooting and for shields has been painfully illustrated by our late experiences with the Boers at the Battle of Ingogo, where the guns were whitened with bullets and nearly all the gunners killed.

perfectly level platform—a case which rarely occurs in practice—is like a ship without a rudder, an imperfect machine!

If then a system of sighting can be devised which will give the gunner without any calculations complete control over the axis of his gun under all conditions instead of only when the wheels are on the level as at present, and then only to a limited extent; and if he can be taught by this System of Sighting to become a good shot with *only the small regulation allowance of ammunition*, it certainly ought to be a great boon to the Gunner, and a *great saving too of expense to the State*. The proposed Telescopic Revolving and simple Revolving sights fulfil all these requirements, because the use of the telescope with cross wires removes all difficulty of aiming, and the corrections for unequal height of wheels, and for wind, can be effected by the simple turn of a screw *without any calculations*, and, being effected, remain perfectly accurate till a change in the force and direction of the wind occurs.

It has been calculated that for every man slain in the Franco-Prussian war two tons of lead and iron were expended; but the percentage of killed by the iron which represents artillery fire was very small as compared with that by the lead. Captain Boguslawski gives the number of men slain at Gravelotte by artillery fire as low as 6 per cent. The only conclusion to be drawn from this is that the artillery fire must have been very wild and bad. This result is certainly not due to any fault in the gun, which is turned out to $\frac{1}{1000}$ of an inch in accuracy of manufacture, but it is obviously attributable to *want of proper training in the men and to faulty sights.*

Depend upon it, gentlemen, that *with the introduction* (1) *of a properly established system of training in gunnery practice for every contingency of warfare*, (2) *of a practically and theoretically correct system of sighting*, (3) *of telescopic sights*, (4) *of breech-loaders*, (5) *of a good retarded action percusso-time fuze for shrapnel, which would burst the shell on the upward bound immediately after graze*, (6) *of shields and armoured gun carriages*, artillery fire will be as destructive in warfare as it is shown it can be in peace time by "Range and "Accuracy" Practice. There will then be developed a new and intelligent interest in the science of gunnery, and a very important era in the future tactics of our artillery.

In conclusion, gentlemen, I beg to tender my best thanks to the Council of this Institution for allowing me to bring this very important subject before your notice, to Admiral Sir Frederick Nicholson, for the honour he has conferred upon me by presiding, and to the distinguished audience for their patience in listening to the enunciation of a system of sighting which I trust may not only prove a boon to the Gunner but a benefit to the Service and country. It is no use waiting for some foreign Power to give us the lead in these improvements. They are patent to everyone and we ought to have them at once. Let us have the courage of our own English opinions. We have a comparatively small Army, and it should be the best procurable at the price.

Objections.

The Delicacy of the Telescopic Sight.

With all due deference to the opinions of the gentlemen who have made objections to the use of a telescopic sight, I beg to point out that delicacy is not a logical objection to urge against the employment of a telescopic sight, because all telescopes must be delicate on account of the glass. The glass being the weakest part of the telescopic sight is therefore in reality its strongest part, for if the glass be broken the telescope will be rendered useless. Theoretically it is unnecessary therefore to make any part of the telescopic sight any stronger than the glass.

The reasonable question to be answered is, whether a telescopic sight be necessary; if it be so, then you must take care of it and be prepared to put up with delicacy of the glass, seeing that no telescope can be a telescope without a glass.

How is the sight to be carried? This is a question which I have been frequently asked. A man who asks such a question seriously cannot realize the fact that accurate fire is the *raison d'être* of artillery, and that without good sights, which are the vital parts of the gun, you cannot extract the shooting powers of that gun. A gun without a sight is like a fine handsome fellow without any brains.

One might just as well inquire how and where the key of a clock is to be carried, or where the Rammer or any other necessary store of the gun is to be carried. *If the telescopic sight be worth having it is worth carrying.*

The Advantages of the Telescopic Sights.

1. That the firer can see to aim at distances equal to the range of the gun.
2. That he can see and seek out objects to fire at not discernible to the naked eye.
3. That he can always lay the "cross wires" on the same spot with absolute certainty, thereby dispensing with the errors incident to aiming with the ordinary sights.
4. That he can detect the position of the point of impact of the shot in the field of the telescope and know whether the shot has hit by the appearance of the object.
5. That a *field gun* on the natural surface of the ground will be able to shoot at short ranges without having to make any calculations at all, at least three times, and at long ranges ten times, better with the telescopic sight than with the service sights, because the firer in action is unable to make the calculations for inclined wheels necessary for accurate shooting with the service sights.
6. Taking a correct aim is independent of the human eye, and of any practice on the part of the firer.
7. That firing can be carried on almost as accurately at *night* as it is in the day time, by directing the "cross wires" of the telescope on a light fixed at the proper elevation and in the proper direction,

because the light is reflected on the "cross wires" which allows of a "line of sight" being taken. This operation could be facilitated by having iron rails fixed on the platform as a guide for the trail to run between.

8. That it can be used to find the range.

Advantages of both the Telescopic and Revolving Sights.

1. That the firer has that complete command over the axis of the piece under all conditions which he has with the present sights only when the wheels rest on a perfectly solid and level platform.

2. That all calculations are eliminated, thereby enabling any uneducated gunner to learn to shoot accurately, provided he has got good eyesight, without the expenditure of ammunition or special training.

3. That the effective power of the gun in action will not depend upon the life of No. 1 of the gun detachment, because every gunner can learn to use these sights.

4. That the instruction to be imparted to the men will be much simplified.

5. That the destructive power of artillery will be enormously increased.

6. That a maximum effect will be produced by the expenditure of less ammunition than hitherto, and therefore the necessary amount of transport will be reduced to a minimum.

7. That a level platform not being required, the artilleryman will be no longer in the anomalous position of being dependent upon the work of the engineer for accuracy of fire, and considerable expense and trouble will be saved in permanent fortification.

8. That all calculations are elimiuated by *mechanical arrangements* which *must* be far less liable to error than when left to the judgment of the firer.

9. That the manipulation of the instrument can be learnt by any man of the smallest intelligence.

10. When once the true elevation and deflection have been found, they are not disturbed, and consequently there is no chance of any error being made from the No. 1 having to set the sight each round; because the revolving sights are lifted out of the socket or grooves intact before firing.

TABLE I.

120 mm. gun placed on a horizontal platform. Wheels abnormally inclined by baulks. Charge, 7·5 lbs. Range, 5,100 yards. Object, a powder magazine forming a mass 4 metres square, with a target 3 feet broad on the top to aim at. 1 metre = 39 inches nearly.

It will be observed that the first shot fired was 30 metres long and 6 metres to the right. The French Officer in this case corrected the error in range and direction by Captain Scott's method himself, and the next shot fell in the required direction.

State of atmosphere and wind.	Elevation.	Deflection.	Short.	Long.	Right.	Left.	
	° ′	′	Metres.	Metres.	Metres.	Metres.	
	12 50	30	..	30	6	..	
Fine weather.	12 30	20	15	0	0	0	
Little wind.	12 30	20	0	0	0	0	struck mark.
Scott's sight.	12 30	20	..	30	0	0	
	12 30	20	5	..	0	0	
	12 30	20	..	5	0	1	
	12 30	20	20	..	0	0	
	12 30	20	..	10	0	0	
Clear, dry.	12 30	20	..	5	0	0	
Strong wind.	12 30	20	40	..	0	2	
Scott's sight.	12 30	20	..	10	0	0	
	12 30	20	20	..	0	0	
	12 30	20	..	5	0	0	

TABLE II.

Range, 2,750 yards. 95 mm. field gun.

Number of shots.	Elevation.	Deflection.	Short.	Long.	Right.	Left.	
	° ′	′	Metres.	Metres.	Metres.	Metres.	
1	5 5	38	40	..	..	8	Target knocked down.
2	5 14	38	0	0	0	0	
3	5 14	38	0	0	1	0	
4	5 14	38	1	0	0	0	Shell hole.
5	5 16	38	0	5	0	0	
6	5 14	38	0	5	0·5	0	
7	5 12	38	5	0	1	0	
8	5 12	38	1	0	0·5	0	
9	5 12	39	1	0	1	0	
10	5 14	38	0·5	0	0	0	
11	5 14	39	4	0	0	0	
12	5 16	39	0	8	1	0	

On this occasion the mark was a target 1·8 metres high, and 1 metre broad. The first shot having been fired with the angle of elevation and deflection from the tables, the cross wires of the Telescopic Sight were aimed on the point of impact of this first shot, by moving the axis of the telescope (horizontally and vertically) by means of the screws of the sight, and the corrected "elevation" and "deflection" thus obtained, were employed to aim the following shot, *which cut the target in half.*

In the course of the firing one wheel was placed in a hole, so that the

angle of inclination of the wheels should be about 10°. The shots thus fired, which were 5th, 6th, 8th, and 10th, gave exactly the same result.

The piece was aimed by different members of the Committee.

The alterations in the angles of elevation were made to test the sensitiveness of sight for aiming purposes. For instance, No. 4 shot with 5° 14′ was 1 metre short, No. 5 shot with 5° 16′ was 5 metres long.

Major Ellis' Table of Shooting with Service Sights at 3,000 *yards with* 16 *pr.*

Round.	Elevation.	Deflection.	Inclination of wheels.	Direction of shot in yds.		Remarks.
				Left.	Right.	
1	6° 10′ throughout.	5′ left.	From 1 to 10 degrees.	9·8		It was intended to give 32′ deflection for No. 5 round.
2		5 „		9·8		
3		0 „		1·6		
4		0 „		4·4		
5		12 „			26·0	
6		32 „			9·0	
7		32 „		2·2		aimed
8		32 „			2·4	off
9		32 „		13·0		target.
10		20 „		7·8		

Captain ANSTRUTHER, R.A.: Captain Scott has taken it as the fundamental principle of his sight, that the line of sight is always parallel to the axis of rotation, no matter how much the gun is turned round. I do not quite see how that is, the foresight being a fixed point, and the sight being movable.

Captain SCOTT: The axis of revolution and the tip of the foresight are fixed points. The line AB is parallel to CD, therefore when it is turned round, the line AB must remain exactly in the same position as it was before, becauseit is the same line.

Captain LONG, R.N.: I am afraid that I am the only representative of my branch of the Service present here to-night; but I am sure, however, that it is not from any lack of interest that they feel in this question. There are many naval Officers who will be very much obliged to Captain Scott for having taken the trouble to come here and explain his sight to us. It appears to me to be a most ingenious invention, and has been very ably explained. I do not quite understand whether the sight remains on the gun when it is fired.

Captain SCOTT: No, you take it off. You could not leave a telescope sight on the gun; you could leave a revolving sight on the gun, but I see no advantage in leaving it on, because when the gun was fired, the concussion would alter the elevation. In the Service they generally put the sights down, and each time before the gunner aims he has to re-set the elevation. Now, supposing that man were shot, the man who came after him might have forgotten what the elevation was; but if you have the sight permanently fixed, so that the man has nothing to do except to drop it into the socket of the gun, and level it, he has nothing to forget, and you can be perfectly assured that if he only aims straight, the shot will go in the right direction every time. The simple revolving sight could be left on, but I do not see any advantage in leaving it on. The French take their sights out, but it is only a matter of habit after all.

Captain LONG: Captain Scott mentioned the auxiliary barrel for getting practice, and as that seems to me a very important point, I wish to ask if he is aware of any instance of its use. Of course, anything which involves a spirit level can be of no use at sea, but it might be of use in practice on shore. I am particularly anxious to ask what is now considered the effective range of siege guns on shore. I should

also like to know what the cost of the sight is; it looks rather an elaborate piece of mechanism, and the question of expense always has some weight in the adoption of these things. Captain Scott did not speak about the Navy, but he mentioned that ninety shots per annum were considered necessary to keep an infantry soldier in practice. In the Navy, our captains of guns, who, of course, are supposed to be the best shots, only fire eight shots per annum with their own guns. They have a great deal of theory, but uncommonly little practice. Then, with reference to this, we must not forget what Captain Colomb has often said in this theatre, that 10 per cent. are all the shots that are likely to strike the mark in a naval action with the vessels in constant motion, and I think that is borne out pretty well by practice so far as there has been any practice.

Captain ANSTRUTHER: Captain Scott said nothing about rapidity of firing, whether he could fire the same number of rounds using the revolving sight. In the German batteries, they consider ten to twelve rounds for a battery per minute about the ordinary thing on service, and eight rounds for slow firing.

Captain SCOTT in reply said: With regard to the effective range of guns on shore, I suppose that is limited pretty considerably by the view, and by the accuracy of the gun. I should think an artillery Officer could tell you better about that. I do not know much about it myself. The cost of one of these instruments, including bracket, sight, and box, is 11*l.*, but of course, the maker gets a large profit out of that. I suppose you could make the sight itself for 3*l.* or 4*l.*, and I do not think that this price is a very material consideration when you come to think of the cost of a shot from a heavy gun. In the first place, every shot that is fired takes out a certain amount of the life of the gun, and supposing a gun will last for 1,000 rounds and cost 10,000*l.*, that is, 10*l.* for each round that is fired, besides the expense of the shot and ammunition, therefore I do not think 11*l.* can be taken into any consideration, when a shot costs so much; in fact, it is nothing compared to the price of the shot. The revolving sight saves a great deal of ammunition, and if you get more effect with it than with other sights, it pays in accuracy alone. With regard to rapidity of firing, the French report states that the rapidity of firing is greater with my sights than with the service sights. When asked whether I can fire quickly with the telescopic sight, I reply that it depends on the traversing arrangements of the gun. If you have a gun with the Armstrong movement, you can "lay" it very much more quickly with the telescopic sight. The reason that you think that you can "lay" it more quickly with the ordinary sight is, that you do not see where you are out. The German batteries fire ten or twelve shots per minute; that sounds very well, but there is no advantage in firing shot away at random. It would be much better to fire two straight ones than ten or twelve bad ones. As to firing eight shots a minute, that may be possible, but I doubt very much whether you would get really accurate fire at long ranges. You might at short, because it does not matter very much; the trajectory is low; but at long ranges, you would find you could not fire eight shots very accurately. With regard to the auxiliary barrel, I merely suggested it because drill without practice is absolutely useless. I take great interest in the matter. I was Instructor of Musketry for some years, and I know very well from experience, if you teach men drill it is not the slightest use unless you give them practice; they won't believe a word you say unless you show it in practice. The reason that I propose a tube inside the barrel of the gun is, that though of course a rifle at the side of it could be fired, yet that would not assist the gunner in manipulating the gun. The object of having the small barrel in the gun is to put them through their drill just as in ordinary firing, and I think if you give them small ammunition it certainly would impress the errors of shooting on the men.

The CHAIRMAN: You will, no doubt, all agree with me that Captain Scott deserves our best thanks for bringing before us this elaborate and interesting paper. We must all feel some regret that he is able to read a very minute, detailed, and favourable report from the Committee of Officers in France, and that he is only able to give very short extracts from the unofficial reports of Officers in England. I am not aware whether the sight has received the same amount of trial in this country as it has abroad, but I think it is manifest that it is fully deserving of such a trial, in order that its merits may be fully tested. It only remains for me to thank Captain Scott, in your name, for his very interesting lecture.

Friday, January 28, 1881.

COLONEL G. G. WALKER, Commanding Scottish Borderers Militia, in the Chair.

NOTES ON THE TRAINING OF MILITIA.

By Colonel THOMAS INNES, Lieutenant-Colonel Commanding Royal Aberdeenshire Highlanders Militia.

I SHALL endeavour, in the following pages, to avoid all topics which may be considered beyond the sphere of an Officer commanding a regiment of militia. A militia Officer, as such, has no claim to attention on topics which he may naturally be expected to leave to others better qualified by a wider and more constant experience. But, on the other hand, there are certain differences in the conditions under which infantry militia regiments are trained from those which regulate the drill, discipline, and interior economy of regiments of the line, and these require to be known and thoroughly understood before the judgment and experience of the most accomplished soldier can be applied, without risk of mistake, to the consideration of almost any question concerning the militia. I am encouraged to hope that, within these limits, the special experience of an Officer of militia of twenty-five years' service and ten years in command of his regiment may not be unacceptable; for I have invariably found in my official communications with the several distinguished Officers who have held the office of Inspector of Militia, and the Officers commanding districts and subdistricts who have inspected the regiment under my command, that any such special information has been always fully appreciated, and any suggestions arising out of it have met with full consideration, and, in some instances, have led to the adoption of changes which have been beneficial.

The different conditions under which an infantry militia regiment is trained, as contrasted with the line, are mainly those of time and opportunity. A militia regiment has but three months for training in the year, whereas the line regiment has twelve. The line regiment has all the varied opportunities of its service at home and abroad to acquire familiarity with the multitude of details of soldiering in quarters, in camp, and in the field; whereas the militia regiment has only the limited opportunities which can be made for it. But, on the other hand, it would be a great mistake to estimate their relative capacity for effective training solely with reference to the proportion of time and opportunity which the foregoing bare statement seems to indicate. In the first place, the militia and line regiments are constituted on different principles. The disembodied militia regiment is essentially

organized for training, and its time and opportunities are, or should be, entirely devoted to training and preparation. Whereas the line regiment is organized for duty, and its time and opportunities for training not being so limited, it is not necessary to economize them so strictly. The difference, however, in respect of time and opportunity, after making this deduction, is very great, and the object of the following pages is to show how, by the proper application of the time and employment of opportunities at command of a militia regiment, this difference may, to some extent, be compensated, and a militia regiment made, in essentials at least, an effective instrument, although perhaps not so polished as its counterpart of the line.

For want of such a handbook in militia training, even Officers of experience, when confronted with these limits of time and opportunity, are apt to assume that a lower standard must necessarily be adopted for militia. I most emphatically deprecate that. Whatever training is given to militia, let the standard of its drill, its discipline, its economy be fixed as high as that of the line, and worked up to so far as time and opportunity will possibly permit. When recruits are assembled for drill or regiments for training, no moment should be wasted, no opportunity lost. Every contingency should be foreseen and provided for. Everything that is done should be thoroughly done; and what cannot be done every year should be done at intervals, so as to fall within every man's first period of service; and what cannot be practised by the regiment should be the more thoroughly taught to the recruits. The staff of the regiment should be as perfect as possible; the observance of details in its duty and discipline, minute and complete.

There is, moreover, an element in the training of militia which is apt to be overlooked, but it is a most important one; the Officers, non-commissioned officers, and privates of the line naturally regard their drill and duty as *work*, and from its constancy, it necessarily becomes more or less distasteful and monotonous; at all events, it excites no pleasurable feeling. Whereas, to the militia, the three months is a change. To those who work hard the rest of the year, it is a holiday; to those who are idle, it is an excitement; and the consequence is a willingness to submit to an amount of drill, duty, and training of all sorts, which could not be maintained throughout a longer period of the year.

Keeping these prefatory remarks in mind, I will now, without attempting any very systematic arrangement, or pretending to exhaust the subject, offer a few notes of my experience under the following heads:—

I. Effective Strength of the Regiment; Recruiting; Leave of Absence from Training.

II. Training in Billets, in Barracks, and in Camp.

III. Recruit Drill; Instruction of Officers and Non-Commissioned Officers; Musketry.

IV. Annual Training of Regiment; Company and Battalion Drill; Discipline; Duties; Interior Economy.

V. Subjects to be practised periodically; Skirmishing and Attack;

Outpost; Camping; Route Marching; Railway and Ship Embarkation; Signalling; Shelter Trench.

Recruiting; Absence with Leave from Training.

The maintenance of the established strength of the regiment, so that it may at all times be ready for service when required, is without doubt one of the most important cares of commanding Officers of militia; and, although it is not possible to lay down rules with reference to it which would be applicable to the very various circumstances under which different regiments are recruited, or adapted to all the various classes of the population from which their recruits are drawn, yet there are some general principles which are universally applicable; and, as these general principles are not obvious to anyone who is not familiar with the details of militia recruiting, I may be justified in directing attention to them.

A regiment of which the establishment is 1,000 privates enlisted for a period of six years' service, requires, say in round numbers, 170 recruits every year to make up for its loss by discharge of men on expiry of their engagement. But, as there is besides a constant loss by casualties, by desertion and by enlistment into the line, 200 recruits per annum may be stated as nearer the actual number; and that would be too low a number if the losses of men from these causes were not to some extent compensated by the proportion of men who re-engage for a second and third period of service instead of taking their discharge on expiry of their engagement.

Some regiments, from the character of the population in the districts from which they recruit, have less difficulty than others in maintaining their establishment complete, but I believe that nearly all find it difficult to maintain a constant and equal supply of recruits. The supply is affected by the state of trade or demand for labour or the condition of certain employments, the regiment gets reduced below its establishment for some years, and, when a favourable season for recruiting occurs, it is again filled up by one or more large batches of recruits. From this irregularity there arises the further inconvenience that, on the expiry of six years from the period of active recruiting, a proportionately large number of discharges on expiry of engagement will necessarily occur, and, if this happens at a period of slack recruiting, the regiment is then reduced considerably below its establishment and, for the time, becomes ineffective. Then, again, although the establishment of the regiment is, say 1,000 privates, 25 per cent. are allowed to enrol in the militia reserve for the line, and consequently can no longer be reckoned on the effective strength of the militia regiment, because, in such circumstances as would call for the embodiment of the militia regiment for service, the line reserve men would undoubtedly be withdrawn from its ranks for the reinforcement of the line, and it would be too late to recruit and drill recruits for the militia; besides that, in such circumstances the recruiting for the militia would be competing with the recruiting which would most probably be required for the line.

These considerations all point at the necessity of providing a reserve

of *trained men* for the militia regiment, and the manifest advantage of utilizing periods of active recruiting in forming such a reserve.

Such a reserve should be formed of men who, after enlistment and one or more years' training, get into settled employment and prefer, if possible, not being called up annually for training. These of course are of the best stamp of men, otherwise they would not obtain such employments. And as they have a fixed residence and their employers are known, they may be relied upon to be available when required.

Commanding Officers have for two years been allowed the discretion of giving such leave of absence from training, but I am not assured that it has been exercised systematically on the grounds which I suggest. If carried out fully, it would provide a reserve of trained men for each militia regiment without cost, and it would at the same time raise the character of the service very much in the eyes of the class of men who ought to fill its ranks, but who have hitherto been deterred from enlisting by the dread of being thrown out of regular employment by the necessity of attending the training of the regiment every year. It is not safe to predict the effect of any measures which may be adopted to promote recruiting; I have experienced many failures of hopeful schemes, but, after two years' trial, I have some grounds to anticipate that this plan of forming a reserve for a militia regiment will prove successful.

The number of such a reserve should be at least equal to the number of the militia reserve for the line which is for the time on the strength of the regiment. But, when recruiting is active, it should be encouraged to the utmost, and, if the establishment is complete, it would be quite safe to recruit as many supernumeraries as there are men retained on the strength of the regiment with leave of absence from training. It would be very desirable to apply to these men the term "militia reserve," and to designate the men who enrol for service in the line as the "line reserve." The term "militia "reserve," as applied to the men who enrol for service in the line when required, is a misnomer; they are virtually a part of the line establishment, and the term "militia reserve" is more appropriate to designate the men who, when required, are ready to fill up the ranks of the militia.

Assuming the establishment of the militia to be 100,000, and 25,000 to be liable to be drafted for service into the line; then by the simple expedient which I have described, 25,000 trained men should be ready to take their place in the militia regiments, and this very considerable reserve for the militia would be maintained without a penny of cost to the public. But the main advantage and importance of the system would be that a militia regiment, when called on upon a national emergency to transfer its quota of reserve men to the line, instead of being reduced to inefficiency, would be ready at once for embodied service by calling up its own reserve; and would complete its effective strength by drawing on a class of men which could not be expected to furnish recruits for the line, instead of competing with the line in recruiting from the mass of the working class.

The main point, however, in reference to the recruiting of a regiment, so long as it depends on voluntary enlistment, is the popularity of service in its ranks, and the reputation of the regiment. Of course a commanding Officer has other and weightier reasons for doing his best to maintain the character of his regiment; but he will, at all events, have some recompense in obtaining more and better recruits.

In a garrison town or headquarters of a brigade depôt the smartness and soldierlike appearance of the men, the drill, discipline, and interior economy of the regiment, are, no doubt, canvassed amidst the class which contributes the recruits, and opinions are spread thence over the district. The men walking out clean, well dressed, cleanshaven, and with canes, and taught to show pride in themselves and respect for their Officers,—a happy medium between slackness and tightness of discipline,—attention to the men's comfort in quarters and messing,—a well regulated canteen and reading-room,—indulgences such as regimental games and prizes for good shooting,—everything, in short, which contributes to making a happy regiment, is most certainly quite well appreciated and has its due influence on recruiting. In dense manufacturing and metropolitan populations such influences may have less effect, and in times of scarce employment needy and starving men are induced to enlist for bounty; but, in the long run, it is the indulgence of a taste for soldiering and the companionship of soldiers which produces a steady supply of recruits and the best description of them; and a commanding Officer who values the reputation of his regiment and aims at the maintenance of a constant effective strength, will do better by studying to make service in its ranks popular with this class of men, than by relying exclusively on bounties and bringing money.

Training in Billets, in Barracks, or in Camp.

A very considerable proportion of the militia is still trained in billets, although, as a system, it has long ago been condemned.

Various reasons, more or less sufficient, may perhaps be assigned in extenuation of this perseverance in a bad system, but probably the most cogent one would be, that no statutory provision has ever been made for providing barracks for militia regiments at their several county headquarters, and the movement of the regiments from their county quarters to barracks or camp elsewhere would be expensive and unpopular. It may also be said, that in many of the smaller county towns the men are sufficiently under observation and control of their officers in billets; in some respects, too, that it is a saving of time and trouble, that, as there are no duties, the men's time can be exclusively employed in drill. And it may be confidently asserted that many regiments which are trained in billets make a smart appearance on parade, and drill well. But, as no one seriously denies that it would be much better for a regiment to be trained in barracks than in billets, it is worth enquiring whether this desirable object can be attained without the necessity of removing the regiment from its county quarters, and without incurring any expense beyond the cost of its billeting.

The cost of billeting is as follows:—

	s.	*d.*
1. 4*d.* per night per man for 27 days' training ..	9	0
2. 4*d.* per night per 20 per cent. of recruits for 56 days' recruit drill, say	4	0
	13	0

or 13*s.* per annum per man of the total strength of the regiment.

The cost of building barracks is as follows:—Quite sufficient quarters for training can be built at the rate of 10*l.* per man, and therefore the cost of billeting is exactly $6\frac{1}{2}$ per cent. of the sum which would provide barrack building as quarters for a militia regiment at its county town. Nothing would be simpler than to frame an Act of Parliament which would enable county authorities to borrow the money for building the requisite barrack accommodation, and the debt so incurred would be paid off by the sums to be annually paid for quartering the regiment, which would be equal to, and in lieu of, what is now paid for billets.

The advantage and ultimate economy of such an arrangement is so obvious, that it is surprising that it has not been carried into effect, even without the aid and security of an Act of Parliament, because the military authorities may always be safely assumed to be ready to sanction the employment of such county buildings as barracks for the militia regiments, and, after a few years' instalments of the cost of building have been received, the value of the building would be a sufficient guarantee for the remainder, in the event of it ceasing to be wanted as a barrack.

There can be no doubt of the paramount importance and advantage of training a militia regiment in barracks or in camp. As already observed, there are many instances of regiments showing very smart, and drilling well for inspection without that advantage, but these cases are exceptional, and depend upon the character of the towns in which regiments are billeted. And, after all, the smart appearance on parade and the drill are but a very superficial training.

It is essential to the making of a soldier out of an average labourer or mechanic in so short a time, that he should be separated from the habits and associations of his civil life as much as possible, otherwise, though he may be fairly clothed and accoutred, made decently clean, and taught to drill with tolerable smartness, he will not have acquired any habit of discipline, or any knowledge of the most ordinary duties and interior economy of a regiment. And, without derogating from the merit of what he may have acquired, undoubtedly what he has not acquired is the most essential part of the rudiments of a soldier's training. Therefore, by all means, and emphatically, let the recruits' drill and training of regiments be carried on in barracks, or in camp. If in barracks, a proportion, consisting of well-conducted married men, whose wives are with them, may be allowed to live out as an indulgence; but sufficient room in barracks should be provided to enable the commanding Officer to withdraw the indulgence whenever it is abused.

A good many regiments of militia have lately been trained under canvas, either at their own county headquarters, or in camps, and much may be said for this system. It no doubt familiarizes the men with much that they would require to know on service, and which barrack training does not teach them; and I shall elsewhere advert to some special advantages which may be attained by occasionally, as part of a system, training a militia regiment under canvas in the country. But, as a rule, I would prefer barracks to camp for ordinary training; bad weather is a great interruption to training in camp, because tents cannot be utilized, as barrack-rooms can, for drill and instruction, and it is not possible to maintain discipline so well in camp as in barracks. But, as compared with training in billets, the advantage of training in camp may be insisted upon as strongly as with reference to training in barracks, and, when barracks are not available, every regiment should go under canvas.

Recruit Drill; Instruction of Officers and Non-Commissioned Officers; Musketry.

The recruits in most regiments of militia are called up for drill for the two months immediately preceding the assembly of the regiment for the annual training; and this plan presents the manifest advantage that this period of preliminary drill of the recruits becomes the main element in the system by which the effective condition of the regiment is secured. Before this, the permanent staff are put through their setting-up drill and course of musketry, and, along with the recruits, a certain proportion of Officers, non-commissioned officers, and privates are called up for duty; the subaltern Officers who have been commissioned since the last year's training join for instruction, so as to pass for their first certificate at the subsequent training. In this way, the recruits' drill becomes the period and opportunity for working up all ranks, so as to be prepared to take the utmost advantage of time when the regiment assembles. At the same time, all the requisite details with reference to the clothing, equipment, quarters, &c., of the regiment are looked forward to, and every emergency should be foreseen and provided for. The training in this way should be prepared for as carefully as a military operation which requires the utmost foresight, and the day of inspection looked forward to as the crisis of the campaign, which will show the results of carefully organized and energetically conducted operations, or betray the want of foresight, system, and exertion.

Two months, when measured by working days, is certainly not much time to allow for converting a raw lad into a drilled soldier, instructed in the use of his arms, and acquainted with the details of a soldier's duty. But it is wonderful how far the essentials of this training can be attained by employing the time well; and when a thing has to be done within a certain time, it is surprising how much more the time may be utilized.

It has been frequently proposed, and indeed is an alternative which has been recommended by authority, that the recruits for the militia

should be drilled at the brigade depôt to which their regiment belongs. But, although plausible at first sight, this would be a complete mistake. In the first place, unless the brigade depôt for two months were completely given up to training the militia recruits, it could not be done at all. Then, as the brigade depôt establishment is not organized specially for training the militia regiment, and feels no special interest in the credit of the regiment, it is not to be expected that the necessary devotion to the work will be manifested; and, above all, supposing that the recruits could be handed over by the brigade depôt at the end of two months to the regiment on its assembly for training, there would have been none of the preparation for the regimental training to which I have already adverted as one of the most essential advantages of the recruit drill. There would be no school of instruction for Officers and non-commissioned officers, several days of the training would be lost before things got into their place, and the recruits, instead of going on at once to learn duty in the battalion, under the company instructors they had been drilled by, would be adrift and fall back.

The recruit drill and the training of the regiment are commonly regarded as distinct, but, properly, they form one continuous course, by which the staff, non-commissioned officers, and a certain proportion of privates are put through a setting-up and preparatory drill, at the same time that the young Officers on joining and the recruits are trained, while also promising young men from the ranks are looked out and put on probation for non-commissioned officers, and every preparation is made, so that not a moment may be lost when the regiment assembles. This can only be done within the regiment, and by the regiment; and, even if the brigade depôt could train the recruits well within the time, which it cannot do, the purpose of what is termed "the preliminary drill," would be only half attained.

The details of the recruit drill may probably vary in different regiments, but generally they will be found to be nearly as follows:

The detachment of recruits and duty men, and Officers and non-commissioned officers called up for duty and instruction, is under the command of the Adjutant or one of the senior Captains of the regiment, who may be present for duty. The number of trained men allowed to be called up for duty depends upon the number of recruits present, being in the proportion of 25 per cent. Assuming the number of recruits to be 200, the proportion of duty men will then be 50. It is desirable that a large proportion of the non-commissioned officers should be present, as this is the only opportunity of instructing them. It is understood that any number of non-commissioned officers may be called up, with their own consent, for instruction during the recruits' drill, provided that their pay does not exceed the amount of the pay of the whole establishment of sergeants and corporals *for one month*, and probably this will admit of calling up for two months all who are prepared to attend, say 30.

For 200 recruits the Officers present for duty, in addition to the Adjutant and Quartermaster, will be a Captain and two subalterns, and there may also be present for instruction, say three young Officers,

appointed to commissions since last year's training. There ought also to be an Officer Instructor of Musketry.

The entire establishment for the recruit and preliminary drill of a 10-company regiment may therefore be reckoned to average:—9 Officers, 29 permanent staff sergeants, 10 drummers, 30 sergeants and corporals called up with consent for drill and instruction, 50 duty men, and 200 recruits.

The first day is occupied in mustering and clothing the men, reading the Army Discipline Act, telling off to rooms, messes, and duties, &c.

The second day, drill squads are formed and drill commenced. There are three drill parades for the six week days, excepting Saturday, when only the awkward squad parades for drill in the afternoon. Arrangements are made for employing the time in the barrack-rooms in case of bad weather, in arranging bedding, clothing, and accoutrements, laying down kits, &c.

The third day, smart recruits are picked out, and an advanced squad formed of Officers and non-commissioned officers.

The fourth day, duty men parade for drill with arms.

The sixth day (Saturday), barrack inspection and dinners visited.

The squad drills continue during the second and third weeks. Saluting drill, *with arms*, is begun, and men not allowed to walk out without canes. In wet weather, Officers' and non-commissioned officers' squad instructed in standing orders, duties, and interior economy. On second and subsequent Saturdays, kit inspection.

The fourth week, extension motions with rifle and firing exercise.

The fifth week, musketry instruction begins. If the detachment is strong, it can be best instructed by half-battalions, and the half-battalions will then do musketry and company drill alternately on forenoon and afternoon parades. The musketry and target practice of a complete recruit's course can, in ordinary weather, be finished by the middle of the seventh week, and the remainder of the time be devoted to company and battalion drill, and instruction of the recruits in duties on guard, &c.

There is, of course, a great deal to be done besides drill and instruction parades. Clothing to be fitted, men's bathing and medical inspection, school attendance, &c.

As soon as possible, the young Officers who have joined for instruction, and the non-commissioned officers, should be put to rope drill and mutual instruction in manual and firing exercise. The duty men can be employed to fill up the rope drill squads. The young Officers ought, also, as soon as possible, to be put on orderly officer's duty as supernumeraries, and to attend court-martial and orderly room; and they should be required to do all the details of duty and to report as if they were responsible. All sorts of possible contingencies should be stated for practice, and they should be required to report as if they had acted under the circumstances stated. If possible, there should be a well qualified non-commissioned officer told off to assist the Adjutant in their instruction. In the same way, a special and careful system of instruction adapted to the non-commissioned officers should be carried

out, and the commanding Officer should make a weekly or more frequent inspection of the whole detachment.

I have hitherto only referred generally to the musketry instruction of the recruits; but, before concluding my remarks on the recruit drill, the subject of musketry requires more special attention, because it is one of those essential things which cannot be thoroughly practised by the regiment during a four weeks' training, and therefore ought to be made the subject of all the more complete and thorough instruction for the recruit, so that every man in the ranks may have the foundation of a thorough knowledge of the use of his arms; and, when that is assured, improvement of the regiment by target practice can be accomplished when its services are required.

It is quite possible to put the recruits through a complete course of musketry instruction and target practice during the recruit drill of two months; and, if it were not possible, it would be a sufficient reason for extending the recruit drill, so as to include it. It is, of course, an essential in the training of a soldier, and, if the militia recruit is not thoroughly instructed in musketry during his recruit drill, he cannot be instructed afterwards; and so the regiment comes to consist of men who have never been properly trained in the use of their arms, and who cannot be trained. A course of musketry instruction and individual target practice during the training of the regiment is a waste of time and ammunition. It produces in target practice very poor results, and does not improve the men's shooting. It deteriorates the drill and discipline of the regiment. It interferes with everything, worries everybody, overworks the company instructors, and is made the reason or excuse for every failure or shortcoming. It is impossible that it should be otherwise. The number of qualified instructors for carrying on the musketry instruction and target practice of a battalion in such a limited time is not nearly sufficient. And if the instructors were available, the time is not sufficient for the target practice. Sufficient ranges cannot be generally available. A few simple figures will demonstrate this. Supposing a 10-company battalion to be only 800 strong, eight qualified instructors are required to a company; whereas the two staff sergeants are all that are practically available. Then for 800 men to fire 60 rounds each, in individual target practice, is 48,000 rounds, and requires, in the target practice alone, the employment of one target for 800 hours, or eight targets for 100 hours, or four targets for 200 hours. Thus, supposing that two double ranges can be commanded for each militia regiment, which is the utmost that can be assumed, it would take twenty days' firing, for ten hours per day, to complete the target practice. The four weeks' training consists nominally of twenty-seven days; but after deducting two days for mustering, equipping, and necessary details, three Sundays, one day for inspection, and one day for return of arms and clothing into store and dismissal, twenty days are all that are really available, and the whole training would be consumed in target practice, without taking instruction into account, or making any allowance for bad weather.

It is unnecessary to argue against what is palpably indefensible.

With an unlimited command of targets, a course of 60 rounds individual firing, or any less number, can be fired by a militia regiment during its training, but the results in target practice and on the drill and discipline of the regiment will be the reverse of satisfactory.

The actual experience of the regiment under my command this year quite corroborates this. The recruits, during the recruit drill, were put through a complete course of musketry instruction and target practice. And, although the number of recruits exercised, 211, was abnormally large, and their target practice, therefore, necessarily[1] occupied a considerable time, yet the result was quite satisfactory. But the musketry course through which the regiment was put during the training, although carried on under exceptionally favourable circumstances, in that the services of two well qualified Officers were available as instructors, and eight targets were at command, and the ranges within a very short distance of the barracks, was not by any means satisfactory. The figure of merit was very low. A large number of men, from want of sufficient time and attention of the squad-instructors, were not properly instructed, made bad practice at first, lost heart, and only wasted their ammunition and the time of the regiment. The target practice had to be carried on without regard to light or weather, and in this way also the practice was bad and the men discouraged. The staff sergeants and non-commissioned officers were excessively overworked, and in many respects the discipline, drill, and interior economy of the regiment suffered, and things had to be overlooked which would not have been so under other circumstances. But, owing to the large number of recruits, only 693 trained men were present at the training; had the normal number of 800 trained men been present, the musketry course would have been impossible. It can never be contemplated that each militia regiment should annually go through any such course of musketry during its training; and, if it were only to do so periodically, at intervals of say five years, for the purpose of giving every man in the ranks a musketry course some time in his service, that object would be much better attained, and with much more satisfactory results, by instructing him thoroughly as a recruit.

I therefore most emphatically offer the recommendation that a thorough course of musketry instruction and target practice should form an essential part of the recruit drill, and that no individual target practice should be attempted during the training of the regiment.

A substitute, however, may be suggested which would be of great practical use, and which could be properly carried out in the course of an ordinary training without interfering with the drill and discipline of the regiment, or rather with the effect of promoting both. And it may be first explained that the principle on which the suggestion is based is that, after having instructed the recruit well in the use of his arms, the next most important matter in musketry is to habituate him

[1] The figure of merit of the recruits, Aberdeenshire Highlanders, compares favourably with the training of line recruits, allowance being made for difference of weapon.

to use his arms thoroughly under control, and to train and accustom the subalterns and non-commissioned officers acting as half-company and section commanders, to completely regulate and control the fire of the ranks. This can only be done by very careful and deliberate target practice in volley and independent firing. Assuming that two days in a training may be devoted to musketry, the time would be unquestionably best employed in training the men to fire with steadiness and under perfect control in the ranks, and the Officers and non-commissioned officers to command and direct the fire in such a perfectly cool and distinct manner that the men might be trusted by habit under all circumstances to rely on their direction. Practically a battalion of ten companies could easily in two days do a preparatory position drill, and fire ten rounds by volleys and ten rounds by independent firing, and only six targets would be required, and the result would be very valuable. Whereas, it would take at least four days of ten hours for the same number of men to fire ten rounds in individual firing, using the same number of targets; and the results, with reference to improvement in musketry, would be *nil*. The twenty rounds of volley and independent firing in two days, if properly conducted, would improve the men's shooting if they had previously been well trained as recruits; and it would attain the invaluable object of steadying them when firing and securing the control of their fire. While, on the other hand, the ten rounds of individual target practice, hurried through, as it must be, in four days, would do nothing to improve their shooting, and it would leave the important matter of commanding and controlling the fire quite unprovided for. With special reference to the training of militia, there can be no doubt that, after a sound and thorough instruction of the recruit in musketry, the most important exercise afterwards in the use of his arms is that which combines target practice with the habit of obedience to the command and direction of the company, half-company, and section commanders, and that would be attained by devoting two days of the training to very carefully instructing the companies in volley and independent firing, and firing ten rounds of target practice in each. The objection may possibly occur at first sight that this proposal would deprive the men of the incentive for improvement of the money prizes for individual firing. But these money prizes would be more effectual if given always for section firing instead of for individual firing. Generally speaking, there are in every battalion and company a few good shots who may be safely predicted to carry off the prizes, and whose shooting, being already good, does not need any encouragement; while the bulk of the men, having nothing to hope for, have no inducement to try to do well. But, when every man in a squad knows that, by failure of a shot of his to hit the target, his own and his comrades' chance of winning prize money and distinction is imperilled, he is likely to do his best, and a keen emulation between companies and sections is created which does much to stimulate improvement.

I have purposely omitted skirmishing target practice, because it can be more properly adverted to when skirmishing drill is discussed in a subsequent chapter. Before leaving the subject of the recruit drill,

I may advert to the system which is adopted in some regiments of completing the training of the recruits and dismissing them before the assembly of the regiment. Under this system the recruits' drill extends to three months, and it presents the advantage of giving more time for the complete musketry course; and when the number of recruits is large it may be more convenient than combining the last month of their drill with the training of the regiment. There is not, however, any material difference in the two plans. The one or the other may be more applicable under different circumstances.

Annual Training of the Regiment; Company and Battalion Drill; Discipline; Duties; Interior Economy.

Let us now suppose the regiment assembled for its annual training; the men clothed, and in quarters. How is the precious time to be employed? Each regiment may have its system, but generally speaking there are three drill parades each day, and, after deducting the two days of assembly and dismissal, two days for the inspection and return of arms into store, three Saturdays for fitting of clothing, inspection of kits, marching order parades, &c., and three Sundays, ten days out of twenty-seven, there remain seventeen days or fifty-one drill parades available. Of these, at least two days, or six drill parades, must be assigned to musketry, as fully discussed in the preceding section, leaving forty-five drill parades for squad, company, and battalion drill, and all those other branches of training which are to be practised. And, if an original manual of field exercise had been specially compiled for the militia, it may be safely asserted that it would not have taken the form of Parts I, II, and III of the present Field Exercise; because, however excellent that manual may be, brevity and compression of much training into little time is certainly not its distinguishing characteristic.

Nevertheless, it is undoubtedly expedient that the militia should be trained by the same manual as the line. And, practically, it is found possible, in the forty-five available drill parades of the annual training, to practise Parts I and II, or squad and company drill, and the most essential sections of Part III, or battalion drill. And Inspecting Officers are generally satisfied with the result of this training, inasmuch as it produces at the field inspection of the regiment a considerable amount of steadiness and power of manœuvring. It is not the object of these notes to propose any new system of company or battalion drill for the militia; therefore, let us suppose that a large part of the training is profitably employed in these exercises; but, as there are branches of training, not embraced in these portions of the field exercise, which are scarcely less important and necessary, it remains for consideration how many of the forty-five drill parades are required and can be spared for these purposes.

Musketry and target practice have already been considered and disposed of in the preceding section, excepting skirmishing target practice, but there remain the following subjects which obviously cannot be dispensed with in the training of an infantry regiment:—1. Duties on guard. 2. Drill in extended order, including "skirmishing" and

"attack." 3. Advance and rear-guards. 4. Outpost. 5. Encampment and field-cooking. 6. Route-marching and embarkation on railway and ship. 7. Signalling. 8. Shelter trench exercise and field engineering. It is, of course, impossible to practise all these subjects every annual training, and a separate section will be devoted to showing how, by distributing them systematically over a period of five years, they may all be practised within each man's first period of service, and so as to maintain the aptitude of the regiment, as a whole, in all of them.

Duties on guard will, of course, be practised when the regiment is quartered in barracks, or in camp, by the regimental quarter-guard; and the best system is to put the recruits, who have been dismissed drill at the conclusion of the recruit drill, on the roster for the duty during the training of the regiment. This at once provides for the instruction of the recruits, and frees the trained men from duty, which would otherwise withdraw them from drill and exercise. In this view it is not desirable to limit needlessly the number of posts and the strength of the guard; because, unless the proportion of recruits be very small, the tour of duty on guard during the training will otherwise hardly include all the recruits. "Duties on guard" will, therefore, not require the appropriation of any of the drill parades of the training.

The remaining subjects, which have been enumerated, although only practised in succession, one or two during each training, will require the employment of a certain number of the drill parades, and, in making the appropriation, it should be kept in view, that preparation will make the time required for the actual drill or exercise very much less. No precise time can be assigned as invariably necessary for all the several subjects, and under all circumstances; but it may be kept in view, that, as the first two weeks of the training are generally devoted to squad and company drill, the actual practice of the extra subject for the year may be perhaps most conveniently assigned to the third week, and may perhaps alternate in the morning and afternoon with battalion drills; and that the preparation for this exercise, which, for the most part, will consist in the instruction and drill of Officers and non-commissioned officers, can be carried on during the recruit drill and first week of the training simultaneously with the squad drill.

In this way, by systematizing the recruit drill and the training of the regiment, and the training of successive years in periods of five years as one continuous course of training for the regiment, the whole assumes an entirely different aspect, and it is found that, although the mass of the regiment is not always present and visible, its cohesion and continuous condition of training is never broken, each man progressing annually during his first period of service, and the staff and a constant proportion of men in a second period of service, may always be kept up to a certain standard. If such a system were sanctioned by authority, and generally understood and practised, Inspecting Officers would know exactly what to expect and look for in every case, and the character of each inspection would

have some relation to the year of the five-years period in which the training of the regiment and the inspection might chance to be. And, without proposing to interfere in any way with the established order of inspection and review, as laid down in the Field Exercise, it may be suggested that the nature of the exercises and manœuvres called for at the drill inspection might easily be adapted to ascertain the progress made in the specialty of the year, and due weight might be attached to failure or to success.

Although it is not possible to include all these special subjects as part of the programme of training for every year, yet much may be done incidentally every year to practise any of them when opportunity offers, and such opportunities should not be neglected. For instance, there is no difficulty in practising the formation of an advance or rear-guard every time the regiment marches out to battalion drill or returns from battalion drill. Each company may parade in turn a quarter of an hour before the battalion, and march off as advance guard, so as not to detain the battalion and waste time. When the company forming the advance guard reaches the battalion drill ground, it can form a line of skirmishers and supports, or it can take up a position as an outpost: or, again, the battalion, while on the march to and from its drill-ground, can practise increasing and diminishing front as the space will permit.

Before quitting the subject of company and battalion drill, I must record a plea for persistence in the frequent use of blank ammunition during drill. Some Adjutants and commanding Officers object to it because it makes the men unsteady, and that is the very reason why I urge its constant practice. It only makes the men unsteady because and when they are not accustomed to it, and because and when the Officers and non-commissioned officers who command and direct the fire, instead of doing that most responsible of all duties in a manner calculated to secure the steadiness of the men, seem to think that hurry and loud words of command are all that are required. Therefore I note as worth attention that every Officer and non-commissioned officer who may by any possibility have to command and control the fire of a section ought to be most carefully trained in giving the words of command, habituated to making the men quick but without hurry in loading and getting ready, cool, distinct, and deliberate in the order to fire; and, after that is secured, the squad, the company, and the battalion ought to be constantly and frequently practised in firing during drills.

Subjects to be practised periodically; *Skirmishing and Attack*; *Outpost*; *Camping*; *Route-marching*; *Railway and Ship Embarkation*; *Signalling*, *&c.*, *&c.*

In the previous section it has been pointed out that there are necessarily several special subjects of training which cannot all be practised every year because the time at command during the annual period of training will not permit; and the obvious and only expedient to overcome this difficulty is to practise in successive years what cannot be undertaken every year. In this way, if all the requisite subjects of

training can be practised by a regiment within a period of, say, five years, every such special subject of instruction will be practised at least once within the term of every man's first period of service, and while the regiment as a whole is kept sufficiently in practice, each recruit eventually has his turn of instruction in each special subject of training.

Without proposing to exhaust the subjects which a soldier's training might properly include, several have been enumerated as the most essential, and as susceptible of being practised in this way; and I will now proceed to distribute these special subjects over the five-years period in such a way as will most facilitate the practice of them, and which will make the five-years period a continuous, systematic course of training.

With this view,—1. Drill in extended order, viz., skirmishing and attack, will be practised the first year; 2. Advance and rear-guards, outpost, encampment, and field cookery in the second year; 3. Route-marching, railway and ship embarkation in the third year; signalling in the fourth year; shelter trench exercise and field engineering in the fifth year.

The time which can be spared for these special subjects from the battalion drill parades has already been considered. It is certainly not overmuch; but if the employment of it is properly systematized and the proper preparatory training of Officers and non-commissioned officers has been attended to during the recruits' drill and the two first weeks of the training, it will be found not altogether inadequate. A more serious difficulty will often be found in obtaining ground suitable for these special purposes; and to practise thus successive subjects of training, the regiment must be prepared to move occasionally and train in quarters where suitable ground may be obtained. To practise skirmishing and the systematic formation and movements of attack, irregular ground must be employed, otherwise the practice, though a pretty field day manœuvre, will be *nil* in any practical instruction. And in this, as in every other subject of special training, no more should be attempted than can be done well and understood by every man in the ranks. To accomplish this, it is of course necessary that every Officer and non-commissioned officer should have been previously thoroughly instructed and made capable of commanding a section with perfect confidence and without blunders. Under command of section leaders in whom they can place confidence the men in the ranks in extended order are as easily directed as in company and battalion drill. But the shouting of orders by the Officer commanding a company, or a large half-company, to the extended line, leads to the men being confused and unsteady. Therefore let assiduous attention throughout the recruit drill and two first weeks of the training be devoted to the preparation of the section leaders in skirmishing as the special subject of that year; and let each Captain, with the assistance of his company drill instructor, be responsible for his section leaders being competent, and let the Major of the half-battalion be responsible that this is attended to, so that, when the few hours at disposal for the exercise arrive, the time may be employed to the best advantage. A

simple movement, advancing and retiring in extended order, over varied ground, with the formation of new lines at an angle or to the flank, the mode of movement being adapted to the character of the ground and the degree of exposure to the supposed enemy's fire, the movement and firing under the perfect control of the section leaders as directed by the company or half-company commander, embraces the most essential parts of skirmishing drill, and when carefully and thoroughly done is practically worth a great deal more than more varied and pretentious manœuvres, imperfectly done. Changes of direction, reliefs, and reinforcements might next be done, but it should always be borne in mind that, in skirmishing drill, the essential is not to practise a great variety of movement, but rather to practise the same few movements over a variety of ground and under varied circumstances, so as to make the men understand thoroughly what they are about and trained to act with confidence and quickness under the orders of their leaders. The bugle sounds ought, of course, to be known by the section leaders, and the men ought to be familiar with the most essential of them, but to conduct skirmishing drill by the bugle, is to sacrifice practical training for a mere showy exercise. When men are well trained and under thorough control in extended order, it is of little importance whether the drill is in the form of "skirmishing" or "attack." In either case, before commencing a movement, the direction and object of it, and the manner in which it is to be conducted, ought to be clearly explained, and the whole line should be halted occasionally for correction and instruction.

The practice of advance and rear-guards naturally follows that of skirmishing, and ought to be practised the following year. By the previous drill in extended order, the Officers and section leaders are prepared for it, and without difficulty they ought, during the recruit drill and two first weeks of the training, to have quite mastered all the requisite formations and the duties of the several parts. But before proceeding to practise advance and rear-guard, beyond the mere drill of formation, it ought to be in view that the mere movement along a road or occupying a piece of ground in such a formation, without any definite object, conveys no instruction. It must be an advance or a retreat in expectation of, or in contact with, an enemy in front or in rear, and the movement ought to be adapted to the nature of the ground, and the supposed circumstances; and, as in the drill of the previous year, the object, direction, and manner in which the movement is to be conducted ought to be clearly explained.

It is obvious, when viewed in this light, that drill in advance and rear-guard can be conveniently combined with outpost drill, and, as the practice of the most essential branches of drill necessarily requires a considerable extent and variety of ground, it would be desirable that every regiment in the year, in which it has to practise advance and rear-guard and outpost, should train in quarters where it can command the necessary ground, or go into camp.

A suitable range of country being secured, a good map of the ground within a circle of, say, $3\frac{1}{2}$ miles round the quarters or camp should be provided, and the country within that radius should be

portioned off, if possible, into eight or ten sections corresponding with the number of the companies of the regiment. A $3\frac{1}{2}$ mile radius gives a circumference or front of 21 miles, or an average of about 2 miles to each company (of ten), and one such section of the front, with the requisite roads belonging to it, should be then assigned to each company; and it is desirable that, if possible, each section of country shall be bounded by roads or practicable lines of passage for infantry radiating from the centre. These conditions are attainable around many country towns where militia regiments now train.

During the first week of the training, the Officers of each company should be required to reconnoitre, sketch, and acquaint themselves with the whole details of the section assigned to them. In the second week, drills in the formation of advance and rear-guards, and in posting of pickets and sentries, should take place; and in the two last weeks, advance and rear-guards, and the attack of outposts, should be practised; each company in succession having to work as advance and rear-guard over the section of ground assigned to it, and with which its Officers are thoroughly acquainted by their previous reconnaissance; and having also to occupy its own section of front as outpost. The companies would also in succession act as the enemy.

The most convenient method for this drill is to march off the company which is to act as the enemy an hour before the company which is to practise advance guard and outposts. The enemy marches out the $3\frac{1}{2}$ miles and posts itself on the section of the front belonging to the company which is to be exercised, facing inwards towards the quarters or camp; or it may be posted at any point nearer to the quarters or camp, and be prepared to retire before the company acting as advance guard. When the advance guard reaches the limit of its section of front, the enemy, having been driven back, or falling back, on its supports, retires out of sight and halts for dinner; meanwhile the company acting as advance guard occupies its section of the front as outpost, posts its sentries, pickets, and reserves with reference to the roads and the ground which have been previously carefully studied. And, after a certain hour, which has been fixed, the enemy attacks.

There is, of course, opportunity for practising an infinite variety of useful training. The Captain in posting and instructing his sentries and pickets, in calculation of time and distance, so as to enable his pickets and reserve to concentrate and hold the enemy in check at any part of the line; and the sentries and commanders of pickets in their several duties. Whatever is done should be done steadily and with a definite purpose, and carefully adapted to the character of the country.

It will be found that the non-commissioned officers and men will take a very lively interest in the drill, if so conducted; and great care should be taken not to allow the natural excitement attending the drill of opposing bodies to lead to mere scrimmage. This is easily checked by sounding the halt, and cease fire, and allowing the Officers time to correct irregularities. After the attack on the outpost has been pushed home, with or without a halt, as circumstances may

dictate, the company holding the outposts may then assume the character of a rear-guard, and hold the enemy in check as it retires on the quarters or camp.

This system of practice by successive companies in advance guard, outposts, and rear-guard over a section of ground previously well studied and opposed by other companies, as the enemy, may be made the means of much useful instruction. In the first place, the Officers learn more or less to reconnoitre and map the ground; to consider the use of roads, buildings, and positions, and the effect of obstructions, and the use of bridges; to calculate time and distance in marching and the proper position of pickets and reserves. Then every non-commissioned officer in charge of a picket or section, and every sentry, has his intelligence increased by having to act with some responsibility, and his power of observation, eye-sight, and hearing sharpened by having to watch the "enemy."

Having been now drilled for two years in company and battalion movements, both in close and in extended order, in advance and rear-guard, skirmishing, and outposts, the regiment should be trained in the third year to march, and move by railway and ship, as forming part of the movement of a larger body, in which time and uninterrupted movement is of the utmost importance. The squad and company drills having been first thoroughly practised, the battalion drills should this year be chiefly devoted to those formations which are required for the movement of the battalion in route; and the utmost attention should be paid to precision in maintaining distances and avoiding the least loss of time in passing obstacles, and in increasing and diminished front. Unless this is clearly pointed out and constantly insisted on, men and Officers never realize the importance of it. Each section must be thoroughly alive to the fact that the half-minute which they lose at any point, when multiplied by the number of sections on the line of march which do the same at the same point, makes a delay of a great many minutes; and when such delays are repeated at different points, the total delay of the march of the brigade or division amounts to hours.

This is easily practised by a regiment as follows:—Say, when marching in column of route in fours, at a narrow point form two deep, and after again re-forming fours, form the battalion "at the halt" in quarter column. To a certainty, unless the regiment has been thoroughly drilled in this respect, the last company will have lost a very considerable amount of time; in a ten-company battalion, with 800 in the ranks, it may be, say, five minutes. By constant practice this may be very much reduced, if not altogether got rid of. And in the same manner other forms of reduction and increase of front, and passage of obstacles, should be practised with the like object, until every man and section and company acquires the habit of pressing steadily on without delay, whatever may be the contingencies which are met with on the march.

As a part of training for a regiment in route, embarkation on a railway or ship should also be practised as a drill. With reference to the movement of a larger body, the rapidity and regularity with which

this operation is performed by a regiment is, of course, of the utmost importance; but also, for its own comfort and discipline, every regiment should be perfectly prepared to embark, otherwise it cannot even leave its headquarters on the most ordinary occasion without a scramble in embarking, followed by irregularity and discomfort during the transit.

As a drill, railway embarkation can be practised on the parade ground. The railway train, carriages, and compartments can be marked off, and the companies told off, the accoutrements taken off, and the embarkation completed. It is a good plan to commence the embarkation by companies from the centre of the train. On most platforms this method combines the utmost rapidity attainable without confusion, with the best employment of the available space. The companies should embark by companies in succession from the centre, each company getting the order to embark from the Officer in charge of the half-battalion, as soon as he sees the preceding company in the carriages and knows exactly at which compartment the next company has to begin. In this way practically no time is lost, and each company occupies exactly the room it requires, and no more.

Generally in ship embarkation time is not of so much importance, but many of the details may be practised with advantage.

At the conclusion of this third training the regiment should be considered as prepared for service. All the minute details of its equipment in marching order ought to be more specially attended to than ever; and its inspection, so far as possible, should, in form, be consistent with this idea.

It will be now convenient to revert to the subject of musketry instruction and target practice during training.

In a previous section, when treating of musketry, it was shown that only two days can be conveniently devoted to musketry during the training of the regiment, and it was proposed, as a proper employment of that time, that the battalion should fire twenty rounds in target practice by independent and volley firing, but the subject of skirmishing target practice was deferred. It may now be pointed out that while the battalion in any year, in connection with its company and battalion drill, can with advantage practise independent and volley firing, it can only properly perform skirmishing target practice in the year when skirmishing is practised as a special drill. For there cannot be a greater waste of time and ammunition than for men to fire at targets while being moved in skirmishing order, unless they are perfectly steady and familiar with the movement, and unless the Officers in command are equally well practised in commanding and directing the movement. The men are otherwise confused and unsteady, and cannot attend to the varying distance and the effect of wind upon their shooting. And having now considered the progress of a regiment's training in the first three years of a five-years' period, and assigned skirmishing drill to the first year, followed by advance guard, outposts, and skirmishing practice over an extensive surface of country in the second year and route-marching and embarkation in the third, it is obvious that the skirmishing target practice ought to

take place in the first year along with the skirmishing drill, and that in that year twenty rounds of target practice in skirmishing order should take the place of the twenty rounds of independent and volley firing recommended as the course of musketry during the other trainings of the regiment.

The regiment having now passed its inspection as being prepared for service and ready to embark and proceed where it is required, it may then be supposed to be left for two years to practise its ordinary drills, carry on its target practice, and, in addition, to acquire some training in matters which are incidental to service in the field, *e.g.*, signalling and shelter trench exercise. It is unnecessary to go into the details of these exercises; there would be no difficulty under most circumstances in carrying out the instruction if properly qualified instructors were available. And, as only a fifth part of the militia would each year be engaged in the exercise, the provision of the requisite instructors in these specialties would not be very difficult.

I have now attempted to lay before my audience the training of the militia viewed as a specialty, assuming that they are already familiar with what is common to the militia and the line. Every military man who has heard my paper will have already remarked that its specialty consists for the most part in the adaptation of the training of the line to the conditions which rule and limit the training of the militia. If it has suggested that view of the matter, it is entirely consistent with my intention, which was not to parade new theories and inventions, but to record the results of my experience in working to the best advantage the system of militia training which has grown up during my service. But I have by no means exhausted the subject; the storage of arms, clothing, and accoutrements during the period when the regiment is not assembled, and the arrangements which conduce to the safe keeping, the rapid and regular issue, and the re-storing of this equipment involve a great many specialties which are unknown in the line; and, though the Army Discipline Act rules the militia as well as the line, there are specialties in its application to the militia which demand consideration. The terms of enlistment and discharge of the militia are also specialties. But these subjects would require a separate paper, for if introduced in their proper places in this, they would have broken the continuity which I have aimed at in presenting the several sections of my notes as parts of a progressive system of training, from the enlistment of the recruit to the inspection of the regiment as fit for service.

In conclusion, I have only to add that, although some suggestions and opinions which I have advanced may not meet with the unqualified approval and concurrence of my military audience, and others may seem trite and familiar, yet, on the whole, I am convinced that those who take a real interest in the subject of militia training will not have heard this paper without having their attention directed to some matter which they will deem worthy of consideration or having something presented to them in a new light; and thus, by drawing attention to subjects which have been somewhat overlooked,

and suggesting expedients for the attainment of objects which have not been overlooked, but, for want of method, have not hitherto been attained, I trust I may not fail, within the modest limits which I have prescribed to myself, in promoting the good of a service to which I have devoted much time and attention, and in which I have spent a longer period, and with a more varied experience, than has fallen to the lot of most Officers in command of regiments of militia.

To my non-military audience I may express the hope that the reading of this paper may have helped to give a more distinct conception of what the militia really is and what it is capable of being made.

Such as they are I offer these notes to the Service not as a well-digested summary of rules and maxims for training the militia, but as a first contribution to such a compilation, and in the hope that it may be the precursor of a manual more trustworthy and complete.

Colonel ROBERTSON-AIKMAN, V.C., Commanding Royal East Middlesex Militia: Having listened attentively to Colonel Innes's able paper, I would venture to make a few remarks on the same, and although my views may differ from the lecturer's in many respects, I am sure it will be understood that we all have equally at heart the object to which Colonel Innes has given so much time and attention. I have commanded a militia regiment for ten years, a volunteer regiment for five; I have commanded hastily raised troops in the field, and have raised both cavalry and infantry for immediate service before the enemy; therefore I have had some experience in putting men together, and observing what is most needful to fit them for war, which might at any moment break out, and call for the embodiment of the militia. Colonel Innes tells us that the militiaman accepts his training in a different spirit to the soldier of the line. I cannot say that I have found much difference between them. Human nature is such that it rebels against the restraint inseparable from close instruction and enforcement of discipline. The putting right what is wrong, even to a spot on the belt, to the uninitiated appears unnecessary worry, and I have found few who like the ordeal through which every man must pass before he becomes a smart and efficient soldier.

In regard to the militia reserve, such as Colonel Innes suggests might be formed with advantage, the experiment has been tried in the volunteer service, and failed. It was the custom in former days to retain men on the effective list after three years' service as efficients, provided they attended the annual inspection and paid their subscription. The result was that the drill and knowledge of duty became so imperfect, that it was found necessary to strike off the rolls annually all non-efficients, and to withhold the Government grant from such useless men.

Were a similar system of reserve applied to the militia, composed for the most part of an uneducated class, which cannot keep up its knowledge by reading, the effect would be worse than that produced on the better informed volunteers. Moreover, the increased expenditure would be considerable, as for each man granted leave from training, a recruit would have to be enrolled and trained for the longer period of three months, while the absentee would forget what he had previously been taught. For any justification of expenditure of this sort, it would have to be shown that a stronger permanent force was required, and that the country was willing to maintain a larger establishment. It must also be admitted that a greater strain would be brought on the recruiting field, which can hardly meet the present requirements with able-bodied men. The classes forming the militia are for the most part unsettled in their habits and homes, the men are mainly recruited from large towns. In such localities forming a common recruiting ground for several regiments, the establishment of such a system would be attended with unfavourable results, and would open the door to fraudulent enlistment, and many other irregularities so difficult to deal with in a service of this kind.

With respect to the *mode of training* a militia regiment, I am strongly of opinion that a simple course of instruction, thoroughly instilled annually, is preferable to an

elaborate course taught by fragments from year to year. The long intervals between the training render it almost impossible to keep up even the preliminaries of drill and a few essential battalion movements. Without going into elaborate details, I have always found that when I attempted too much I got nothing done properly. The lecturer recommends the removal of the militiaman from civil life while under training—this is most important—but sees no objection to granting leave from training, and allowing men to visit their homes in uniform. This practice has been found very mischievous in its effects. No sooner does the man on leave return to his home, than he reverts to his slovenly habits, and overstays his pass. Defaulters of this kind are so numerous in some regiments that they have to be let off with a reprimand or some slight punishment, too trifling to stop the evil. Thus authority is brought into contempt. Colonel Innes has called our attention to the desirability of observing a happy medium between tightness and slackness of discipline in militia training. In my humble opinion this is the plague-spot on the militia service, and is the foundation of all the irregularities practised therein. The first and foremost essentials towards effecting a proper training of militiamen are the exaction of implicit obedience and a strict fulfilment of their contract with the Government. Before I enforced these conditions by trying men by court-martial and otherwise punishing them severely for any infringment of the same, I had little hold over my men, and was inundated with applications for leave, and transfer to other regiments. These I refused except in special cases. Such was the disorder, it took several days to muster the regiment, a great number of whom made their appearance perfectly drunk. I believe that this disgraceful state of things exists in many places at the present time, both in town and country regiments. Since I adopted stringent measures to eradicate these evils, I have been enabled to muster and equip my regiment in a few hours, only about a dozen men joining afterwards. I need hardly say that a "happy medium" between tightness and slackness would never have brought about this desirable change. So far from the men disliking strict discipline, they prefer it, provided it is enforced with even-handed justice; but when punishment is uncertain, the defaulter is induced to commit himself in the hope of getting off, and when punished feels aggrieved, and discipline suffers accordingly.

With reference to *musketry instruction*, I entirely concur with the lecturer's proposals, as being the only means of improving the shooting of the militia. I would even go farther than Colonel Innes, and devote the whole three months of recruit training to squad drill and musketry. What I mean is a long course of ball practice, consisting of from four to five hundred rounds per man, shot steadily at a target; this would stick to the learner for life. The art of shooting when once acquired can never be forgotten. Nothing but a long course of ball practice will enable the men to conquer the nervousness occasioned by the noise and recoil produced by a service charge. As musketry is now carried out in the militia, it is calculated to defeat the object in view. A hurried course given to the whole regiment, and a few rounds of ammunition discharged at the target at long intervals of time, lead to the contraction of the worst faults. The amount of firing is just sufficient to confirm the bad habits engendered by imperfect teaching. The squads are so large that much valuable time is wasted; and as the lecturer truly points out, drill and discipline suffer from the obvious uselessness and irksomeness of this kind of instruction. The result would be totally different if the men were made thoroughly acquainted with the use of the rifle before joining the ranks, when the number (say two hundred) could have the benefit of the instruction of the whole staff. On re-attestation the old members might be put through a full course with the recruits, during the last month of their training, before joining the ranks for a second period; but I fully concur with Colonel Innes that more harm than good is done by sending a regiment seven or eight hundred strong to musketry under twenty non-commissioned officers as teachers.

The lecturer has recommended the *building of barracks* for the militia. The Government can hardly be expected to incur so great an expense for the accommodation of men whose annual training is only twenty-seven days. It must be borne in mind that unoccupied buildings soon get out of repair, the expense therefore would be out of proportion to the advantages derived. The militiaman, however, has a right to

expect accommodation of a kind to secure comfort and cleanliness. I am in favour of inexpensive huts or sheds with sound roofs and dry flooring. I have no objection to straw as bedding, but the building should be provided with tanks of water and lavatories, in order to enforce habits of cleanliness. This is not the climate for living under canvas, and though no disease may appear at the time the men are encamped, the seeds of consumption and other disorders are often sown, of which no record is made, as those afflicted disappear in the non-training period, or are rejected and discharged prior to the next training. I have lost several valuable staff-sergeants and many men by disease contracted under canvas, though scarcely any sickness was discoverable at the time.

In conclusion, I would submit that good interior economy and strict discipline are of far more importance to a militia regiment than extended and imperfect notions of drill. With all due deference to Colonel Innes, I humbly submit that his programme is far too elaborate. On the other hand, by keeping to a few essential battalion movements after the rudiments of a soldier's training have been thoroughly instilled, year after year, very excellent results may be obtained from the militia when called out for field service.

Major TOMPSON, Adjutant, 2nd Staffordshire Militia: As a Militia Adjutant of many years' experience, I trust I may be allowed to say a few words on the able lecture we have just heard. I do not intend to criticize anything that Colonel Innes has said, for even if there were room for criticism, it would ill become me to criticize anything that is said by a superior officer. I wish simply to make one or two remarks, and with your permission, to offer one or two suggestions, as I believe I have the honour and privilege of addressing several Militia Commanding Officers. I desire to take this opportunity of mentioning one or two little matters which in my humble opinion are deserving of consideration, it being, I believe, the object of this meeting to consider the efficiency of the militia service, which we all have so much at heart. I am one of the many who quite think that the training of militia recruits at a brigade depôt is a move in the wrong direction. I was glad to read in the discussion which followed the very able lecture delivered in this theatre in May last by Colonel Walker, that Colonel Garnham stated that his regiment had tried it for two years (1877–78), and found it fail. I was not in the least surprised to hear it, for it is the greatest mistake to suppose that men only join militia regiments for the sake of the ten shillings they get on enrolment. That is far from being the case. Some men no doubt do so; but in my own regiment I have no hesitation in saying that at least one-half, if not more, of the recruits who join it, do so not so much for the sake of the ten shillings, as for the pleasure of serving with their friends and companions in civil life; and it is quite pleasing to see the rivalry which exists amongst these young men when up for drill. There is rivalry between individual and individual, between company and company, and between detachment and detachment annually; the natural result being that they all become very efficient soldiers. But if the recruits are to be drilled singly, or two or three at a time, at a brigade depôt immediately on enrolment, not only will all this desirable rivalry disappear, but I am quite sure that it will have a most injurious and detrimental effect upon the recruiting for the militia. Colonel Loyd Lindsay is reported to have said here on the 21st May last, that (speaking about the number of recruits who fail to join after enrolment) much blame was to be attached to militia Adjutants for the want of care they took in raising recruits. I am sure that had Colonel Loyd Lindsay any idea of the immense difficulties we Adjutants have to contend against in this matter, he would not have made the remark. My average of recruit absentees is two per cent. of the number enrolled, and I flatter myself that it cannot be complained of. The system of recruiting for my regiment is as follows: In the first place, a man who wishes to join the regiment is required to produce a certificate of character and residence signed by a police constable. The recruiting sergeant then goes to the man's residence and makes stringent inquiries, after which (if all satisfactory) the man is medically inspected, and then enrolled, and if any gentleman here can suggest any better system, I shall be only too glad to hear it. Colonel Innes has referred to army signalling. I quite agree with the Colonel as to the importance of army signalling, but who is to teach it? The Adjutant cannot, for he is not allowed to go through the course of instruction himself. I have

applied for permission to go through the course, but have been refused. Now, with your permission, I wish to refer to one point which has not been alluded to by the gallant lecturer. We all know how much a good band adds to the efficiency and popularity of a regiment. Such being the case, I wish respectfully to suggest that militia commanding Officers endeavour to induce the War Office authorities to make us some allowance for our band expenses, which as we all know are very considerable. The Government allow 80*l.* a-year to each line regiment for the maintenance of their band. Of course we cannot expect a similar allowance; but I really think that, if strongly represented, we might get 20*l.*, which would be better than nothing. One word upon the subject of the militia permanent staff. We cannot have an efficient militia regiment unless we have an efficient permanent staff, and to have efficiency we must have contentment and satisfaction, neither of which will exist in any permanent staff in the service so long as the present regulations relative to the allowances for lodging, fuel and light, remain in force. The pensioner sergeants get very much less than their young and junior comrades who are serving on their line engagement. The difference costs the country but a mere trifle, but is the cause of the greatest dissatisfaction and discontent. I am further of opinion that the quartermaster-sergeant, the paymaster-sergeant and orderly-room clerk, each of whom have very important and arduous duties to perform throughout the year, should during the training period be allowed the extra duty pay now granted to colour-sergeants of companies.

Major CRAIGIE, Royal Perth Militia: I feel compelled to offer, on behalf of many brother Officers, our thanks to Colonel Innes for the very interesting paper which we have heard this evening. There were only one or two points that occurred to me as necessary to refer to, the first was with reference to the question of barracks. Colonel Innes believes, and I heartily concur with him, that the militia regiments benefit very greatly by invariably training in barracks. In making that suggestion, however, he stated also that it would be a good thing if the county authorities could be empowered to erect barracks where these were still required. I fancy that that would be a step in the wrong direction. If new barracks are to be erected at all, they ought to be erected by the Imperial Legislature, and on one general system throughout the country. The figures quoted by the lecturer showed us that 6½ per cent. on the capital value of such buildings was really expended in the annual cost of billets at the present time. But the annual charge for the cost of barracks erected by the Government ought to be and might be less than of barracks erected for county authorities. Counties are not able to borrow on such a favourable rate as the Government. A county authority can seldom borrow under 4½ per cent., whereas the Crown can borrow at 3 or 3¼ per cent.; therefore if barracks are to be erected at all they ought, on the ground of mere economy, to be erected by the Imperial authority. Besides, it would seem also if we are committed to the localization scheme now in force, any barracks must be built as part of the general system of depôt centres, and therefore I think it would be wrong on all accounts to go back to the county authorities whilst we at present have county buildings and barracks absolutely vacant and useless.

With reference to other matters, I should cordially concur with what has fallen from the gallant Colonel who has opened the discussion, and with the lecturer, as to musketry instruction. I have had some little experience in this matter, having held the post of musketry instructor in my regiment for twelve or thirteen years, and I am thoroughly convinced that with any short system of training such as we now possess, the whole thing is a farce, giving more trouble and annoyance than any other part of the training, and no commensurate results for the efforts. I am quite sure that the period of recruit training is the proper and only time for attempting anything like instruction in the theoretical part of this work. I would venture to express some doubt as to the proposals of the gallant lecturer with reference to target practice—volley firing and independent firing. I quite see the advantages of the plan, but I am afraid that with regard to the time at our disposal it presents great difficulties. It would not be easy to secure the thorough control by practised and intelligent section commanders and non-commissioned officers so needful under such circumstances. I should like to see it done, but I feel some hesitation whether it would be practicable, and whether in some cases it would really be safe with the men

we have often to deal with. I am one of those who also rather hesitate to endorse the lecturer's suggestion that we should increase the amount of blank firing used during training. If we are to have more blank firing than we have now, I think it should not be deferred to the period of training at which it is usually practised now. That is to say, that the men should not have blanks served out to them merely for one or two big field days at the end, but that we should instruct them in steadiness, coolness, and regularity in firing by companies or even in smaller bodies where individual mistakes are easily seen and can be easily rectified. I thoroughly agree with the suggestion made as to varying if possible one or two of the specific subjects of training for a militia regiment yearly, and varying the ground over which regiments are trained: many regiments for years are trained on the identical ground, and every movement is almost identical with that of the year before. I have seen regiments unhappily trained in this way somewhat thrown out by being called upon the work on different ground. There is of course great difficulty about moving regiments to any distance from their head-quarters, but though it is a difficult thing and costs money, it requires the attention of the authorities as to whether once in five years a regiment would not be all the better for being moved to a different spot. I was rather alarmed at the long programme of "extra" subjects which the gallant lecturer has suggested to us as possible. For my own part, I am sure militia Officers would gladly welcome opportunities for learning those subjects thoroughly; but I am afraid, even with the modification suggested in the paper, that time would be wanting, and therefore I cannot help urging again the suggestion which has often been made before, and certainly should be strongly supported, that every regiment once at least in every five years should be trained not for a period of twenty-one or twenty-seven days, but for at least two months if not three consecutively, even if to obtain this advantage one short training in each five years were sacrificed and omitted. If such an extended period of practice were granted, I am sure the efficiency of the force and the technical knowledge of officers and non-commissioned Officers would be greatly increased.

Colonel FELLOWS, Royal Hertfordshire Militia: I only rise to state my experience as to the character of the militiaman. I have been in the Hertfordshire Militia for twenty-six years, and my experience of the character of the militiaman is quite the reverse of that which was given us by the gallant Colonel who first opened the discussion. I have found them as a body most respectable men; and when we were going to Aldershot in 1874, there was a petition presented to the War Office by the inhabitants of the town of Hertford and neighbourhood, to make us remain in the county town, and now great regret is expressed that the regiment is likely to be moved to Bedford. The men I have always found to be respectable country labourers, and honest, the majority of them in constant employ, leaving their employment to come out for a month's soldiering. From December, 1854, to October, 1856, and for 24 annual trainings, they have been billeted in the public-houses of the town, and during that time scarcely has a civil charge been preferred against any one of them.

Colonel ROBERTSON-AIKMAN: The gentleman who last spoke has, I think, misunderstood what I intended to convey. It was far from my intention to cast a slur on militiamen, much less on those of my own regiment, who are as respectable and well behaved as any in the force. My meaning was, that the process through which every man must pass to become a smart soldier is distasteful to most men, whether militia or linesman.

Captain J. C. R. COLOMB, R.M.A.: I have been somewhat anticipated by one of the speakers, so will not trouble the meeting for more than two minutes, but having been an Adjutant of artillery militia, under difficult circumstances, I think I am justified in offering one or two remarks to the meeting. On the question of barracks, I suppose there must be an universal accord of opinion, that where you have a short time to train raw men, the barracks is the proper place to do it. I only allude to the question of barracks because I think, as I have expressed in this Institution twelve years ago,[1] that there would not be a difficulty in providing barrack accommodation for training militia, if our military system was what it should be. It does

[1] *Vide* "Distribution of our War Force." *Journal*, vol. xiii, p. 70, 1869.

not involve the element of cost to such an extent as building barracks, which would be idle for nine or ten months in the year, only to be used for the training of militia: and for this reason, that if your localization scheme or your plan of annually training your military forces, of which the militia is but a part, is complete, surely the regular troops in the district should have their camp equipage at their disposal, and it surely would be a desirable thing that they should use it and be in each year a certain time under canvas. Therefore, looking at the militia from a broad national point of view, as part of the great services of the country, I can see no difficulty in such arrangements being made as that when the militia of the district requires the barracks for their use, the troops should vacate them, and carry on their annual training under canvas. I have not altered my opinion during eleven years, and I do think that there is more chance of militia getting barrack accommodation by taking this broad view, than by proposing to build barracks for which the country and the House of Commons will not pay.

With reference to the training of the militia at the brigade depôts, I think it would be destructive of the essence of your militia life. I say so, from my brief experience, because I can see that the old remnant of your county organization, as far as you can preserve it, should be preserved, and by handing over the instruction of your recruits to other agencies, you do away with the very thing you want to establish, *esprit de corps* and individual pride. I have listened to the lecture with the greatest possible interest, and I think the Institution, as everybody must feel, is under great obligation to Colonel Innes for the pains and trouble he has taken to raise this discussion. But I do maintain that it appears to me to be practically impossible to do all the things that are suggested in that paper. I say so with great deference, because I know the views are put forward by one most competent to speak by long experience; therefore I hope you will pardon me in expressing simply the opinion that I could not see how it is possible to carry a militia regiment from perfection to perfection each year during periods of a few days with long intervals of time intervening between. My opinion, although I have no right to use that word, at all events my conclusion is, that after all, what we can only hope to do, with the limited time and money allowed us by the country for the militia training, is to lay solid foundations, upon which, when the regiment is embodied, you can build up quickly and efficiently regimental perfection.

Lieutenant-General A. HERBERT: Mr. Chairman and gentlemen, though I am not a militia man, I have for many years taken great interest in the force. I have had many militia regiments under my command, and I believe I am the only Officer in the army who has ever commanded a militia brigade, therefore I hope you will excuse me in making a few remarks. I am well acquainted with Colonel Aikman's regiment, and have had his corps under my command at Aldershot. I have also, on several occasions, seen Colonel Innes's regiment; they both are excellent, almost as good as you can possibly find; Colonel Aikman's system with his regiment succeeds admirably. He can move his regiment through a thick wood without the slightest confusion. I have also seen Colonel Innes move his regiment at the manœuvres uncommonly well. But you must remember that these regiments are composed of a totally different class of men. If Colonel Innes tried to manage Colonel Aikman's regiment by kindness, he would find them throwing off their hats and laughing at him; and, I must say, I think if the Aberdeenshire Militia were managed rather in the martinet line, which is necessary with the London corps, there would be great dissatisfaction. I therefore think we must not discuss the militia as being all to be guided by one dead level. Every county is different. In one year I inspected fourteen regiments of militia, and therefore I had pretty good opportunity of seeing the different classes both of men and Officers. What a militia regiment depends on chiefly is its commanding Officer; without a good commanding Officer, a militia regiment is no good. I do not think many of the Officers have read the report of the Militia Committee (Colonel Stanley's), of which I was a member. This report recommended the Government that additions should be made to the barracks at the depôt brigades, of the style advocated by Colonel Aikman, viz., "that good "hut barracks should be built, in which the men could be placed during the time of "their training." We also went into the subject of musketry instruction, and we recommended that one year in every four or five should be devoted entirely to that

subject. It was after taking the evidence of the Chairman of this meeting, and of many other valuable Officers, that we came to the conclusion that it was impossible to complete the musketry instruction during the training, and that therefore one training should be entirely given up to that subject. Turning to the extra subjects alluded to by Colonel Innes, I think they are totally incompatible with the training of militia. Signalling even in line regiments cannot be carried out, because the men have not the time for it; constant practice is absolutely necessary to make a signalman of any use. I tried when commanding at the Curragh to encourage signalling. I kept the men at it day after day, and yet I could not get a signal from headquarters understood or conveyed correctly on field days, and therefore I think the Government is quite right in not allowing the Adjutant of a militia regiment to waste his time, and that of his men, in endeavouring to teach this subject. The most important consideration is the training of Officers and non-commissioned officers.

In Ireland I found we gained immensely by having schools of instruction for non-commissioned officers of the militia volunteer sergeants. These schools of instruction I established at the different brigade depôts. I happened to be personally acquainted with the majority of the Colonels commanding the militia regiments, and as a favour to myself I induced them, in the first instance, to send from two to four non-commissioned officers to these schools. The sergeants who were sent up lived at the sergeants' mess, they went through a regular course of training, and after six weeks or two months came out, having learned a great deal, besides having mounted guard, and performed all duties as supernumeraries.

If you simply call up a sergeant out for the militia recruit training, he can only learn a little recruit drill, he does not learn the duties of a non-commissioned officer; therefore what I have always advocated, and what has been advocated by a great many militia Colonels, is the establishment of a school of instruction where non-commissioned officers of militia shall be sent for a certain period, say three months, where they shall receive the pay of a sergeant, and go through the course of training from beginning to end, and be instructed in everything that a sergeant ought to know; then they would be really useful when called out with their regiments for duty. If this plan was carried on every year, the majority of non-commissioned officers of regiments would be trained. Some of the militia non-commissioned officers cannot be persuaded to attend these schools for training. We certainly found some could not spare time, because they received high wages; mechanics, men in good employment, miners, and others who receive from four to six shillings a-day could not be expected, especially if married, to give up their high wages merely to become efficient non-commissioned officers; but we found in Ireland that a large number of the younger non-commissioned officers were glad to receive instruction if allowed to do so when work was slack, and if encouraged by the Officer commanding the depôt brigades. These young non-commissioned officers were, if they wished, made honorary members of the sergeants' messes, and treated as non-commissioned officers in every respect.

I omitted to say that I entirely approve of Colonel Innes's scheme for a militia reserve, and consider that his system of dividing the training into various periods of instruction is admirable, although probably in every corps certain modifications would be necessitated by local contingencies.

This lecture no militia Officer could hear or read without acknowledging the benefit he had derived from Colonel Innes's remarks and experience.

Colonel ALDRIDGE, Royal Sussex Militia: I am sure all those of us who belong to the militia are extremely indebted to the gallant Officer who has just resumed his seat, for the observations he has made on the efficiency of the militia service, and for the suggestions he has thrown out. I also wish to express my thanks to Colonel Innes for the paper which he has read. General Herbert has anticipated some observations I was going to make, which were to point out that in the recommendations of Colonel Stanley's Committee the very question of barracks for militia is proposed, and therefore that the method which has been suggested by all those who have spoken this evening, of putting all the militia regiments under huts rather than tents, is contemplated, and I hope at some future time, when things look better in the country, it will be carried out, as I feel sure that it will tend to the greater efficiency of the

militia service. I command a regiment which has been for many years under canvas, and I confess I find that under canvas the militiamen conduct themselves during the training extremely well. The camp is in the immediate contiguity of the brigade depôt, and we have therefore a certain amount of convenience from the accommodation of the brigade depôt barracks; and I am bound to say I see no objection to militia regiments being trained under canvas if the weather is at all favourable, as it is sometimes even in an English summer.

My chief object in rising is to express to some extent my dissent from what Colonel Aikman stated as his experience of militiamen during the time of training, and of course this may be explained by the differences, as has been pointed out, which exist in the material of which the regiments are formed in different places. In a country regiment, such as I command, I should be sorry that it should be said that I could not trust my men to go away from Saturday till Monday. I give frequent leave to those who are well conducted, and they know that it is necessary to return at the expiration of their passes and to do the remainder of their duty. I think it is a great advantage that militiamen should be seen about the country in their uniform during training, and should have such freedom as is compatible with doing their duty. I think the lecturer's suggestion a very valuable one, that commanding Officers should exercise more frequently the discretion that they have to give leave from training to men who are thoroughly trained and who have settled employment. I think it would greatly add to the enrolment of men in the militia if it was known that after two or three years, certainly if it was known that in a second engagement such men could get leave of their commanding Officer for the whole of a training. I agree with the lecturer that it is desirable that there should be a happy medium between too great tightness and too great slackness. That indeed should be the way, in my opinion, which a regiment of the line should be commanded, and still more the militia, because they do not like to be brought up quite so tightly as perhaps private Thomas Atkins, who is bound down for the whole of the year to do his duty to his Queen. If they find the line is drawn too tightly during the training, there are means by which a militiaman can avoid appearing for another training, and undue severity in cases where men are generally well conducted, would lead to the absence of the men when you want to get them up for their work. As to musketry instruction we are all satisfied that the present system is not satisfactory; and I believe it has been found and acknowledged at the Horse Guards, that the system as recommended by Colonel Stanley's Committee of instructing a regiment by putting them to musketry only for the whole of a training, is also not entirely satisfactory, and I have reason to believe, and I suppose the information will shortly be made public, that it is intended that recruits should go, during their recruit training, through a full course of musketry instruction. That certainly, as Colonel Innes has suggested, is the only way in which a man can be properly trained in the use of his rifle. Let him once learn it, and he is not likely to forget it; once trained, he is afterwards an efficient man with the rifle.

The lecturer seems to me to propose in many points too great restriction on the way in which the commanding Officers should command their regiments and I should think it would be better left to the commanding Officer in each case to see what his men could do, and command them in the way he thinks best fitted to make them good militiamen. It must be remembered, that we ought to train the militia thoroughly in the rudiments of drill, and drill is what we want to teach them, not to be soldiers in the field. Soldiers in the field can come afterwards if they are wanted: the thing is to make them efficient machines, to understand their work, to be obedient and respectful to their superiors, to start them as good soldiers, and I will undertake to say if they are drafted afterwards with their linked battalions of line, or called upon for active service, they will soon learn outpost duty, and their duties in the field.

Colonel EVELYN, 3rd Royal Surrey Militia: I have been particularly struck by the very useful and practical lecture we have heard to-day, and I think the admirable way in which almost each day of the preparatory drill was marked out, will convey very useful hints to many commanding Officers, however great their experience may have been. I only hope we shall be able to carry out these matters to the best of our individual judgment; but some commanding Officers have not quite the same

facilities for doing so that others have. Those that belong to brigade depôts are entirely dependent upon the Officer commanding the brigade depôt, who generally uses great discrimination and good judgment; but still the regulations say—I think it is in the Auxiliary and Reserve Forces Circulars of 1875—that the commanding Officer of militia must not interfere with the drill during the preliminary drill. He may go there if he likes in his black coat, but he must not put on a red one, nor interfere in any way: it is clearly laid down.

Colonel AIKMAN: But it is not carried out.

Colonel EVELYN: I think it is. I do not think one would be justified in doing it, and I know it is carried out in some cases. Commanding Officers have no business inside a barrack yard except as private individuals during preliminary drill.

There is a general consensus of opinion that barracks are the best places for regiments if it can only be carried out. Of tents I have had great experience. As General Herbert may remember, I had the very great advantage of serving in the very militia brigade to which he referred, under his command. I have been in tents a great many trainings, and they are certainly preferable to billets. There is one objection—that three months under canvas during the wet and wintry summers we often have is too long a time for the old staff-sergeants, many of whom have done twenty-one years' service in the line before joining the militia. The hardship is bad enough for the recruits, but worse for the old sergeants. But most distressing cases have come under my observation. I have known men discharged with chronic rheumatism caught from living in tents. I had one poor fellow that lost the sight of both eyes from a cold caught that way. All this causes a difficulty in recruiting, and I mention it to urge the extreme importance of providing barrracks as soon as possible for the militia. With regard to drill, perhaps my views on that subject are not identical with those of the lecturer. In addition to what is actually learned, to form square and to deploy, &c., there is a great moral force in drill, and for men who are only out for a few days, and who have not regularly embraced the profession of arms, I think the fewer movements you teach them, and the more steadily they are done, the better. For that reason, though, as an old Rifle Brigade man my predilection would be for light drill, as an Officer commanding a militia regiment I am fond of a very steady battalion drill with perfect silence in the ranks. A man who has been kept perfectly steady and silent for an hour and a half's drill is likely to be much more steady in his barrack room, and much more amenable to discipline and the orders of his Officers. As for the extra subjects, I would also dismiss them as far as privates are concerned; but I think it is of essential importance that every encouragement should be given to Officers of militia and non-commissioned officers to gain knowledge of these subjects. There is no reason why Officers of militia generally should not understand the outpost work, to tell off a company for outpost duty, to post double sentries, &c.; and there is no question why he should not understand somewhat of surveying, be able to make a rough sketch of country; it is easily done, but still there are few Officers of the militia who know anything at all about it. As to the main principles of fortification, it seems to me absurd that a man even though only a militiaman should not be able to tell what a ravelin is, or know the difference between the escarp and a counterscarp of a ditch. I am no engineer myself, but I should be ashamed not to know the A B C of the profession of arms; and still we find in militia regiments, and until lately regular regiments, a very small proportion of Officers who know anything at all about it, who really know the difference between the first, second, and third parallel. As to the time sergeants are kept under canvas where regiments are under canvas, it is undoubtedly too long, and injures them very much; and if I might make a suggestion about providing barracks for militia, I would ask you first of all to remember that the counties in the old days provided very good stores. My own regiment had admirable stores, with quarters for all our sergeants and drummers, guard-rooms, magazines, washing places for the men, a little field for the assembly, and everything absolutely necessary: but when brigade depôts were formed, we had to give up all that, and we went where we had no adequate accommodation, not even quarters for the sergeants. The sergeants were only to live in the barracks when the barracks were not required for the regular troops, and whenever a draft came from India, they were to be turned out to get their lodgings as they could.

The cheapest way to accommodate the militia regiments under existing circumstances, would be to give up half the depôt centres to their exclusive use, and to concentrate the depôts of line regiments in the rest of these establishments.

Major-General LOWRY, C.B.: At this late hour I will only say how indebted I think the Officers of every branch of the service are to Colonel Innes, and to you, Colonel Walker, now occupying the chair, who last year gave us so admirable a paper on the same subject. I am satisfied the army at large, as well as its highest authorities, derive very great advantage from receiving, as we do in this Institution, the practical experience of men who, like yourselves, have so long and well commanded regiments of militia; and who come, as you have done, and give us the outcome of that experience. I have had nothing like the practical insight into the working of the auxiliary force of my old Commander, General Herbert, who addressed you a little while ago, but, as a line Officer who has inspected many militia corps in the North of England, in Ireland, and in the great Dominion of British North America, I cannot deny myself the privilege of testifying to the marvellous aptitude with which I have ever found the force to apprehend and utilize the training given them.[1] To me there has been, in the course of my soldiering life, no deeper interest, no greater pleasure, than that resulting from the time spent in superintending the training, or inspecting the militia force of the country, and of her rapidly growing dependencies. No one, I am satisfied, can fail to be struck with the ready and quick response they yield to the example and instruction of their officers, and I hold it to be of immense importance that greater facilities than yet accorded. be given by Government to both officers and non-commissioned officers of the auxiliary forces, to acquire a deeper and fuller knowledge of the art of war. I trust the report of the Commission to which General Herbert referred will powerfully tend in this direction; for everything done for the force will amply repay its outlay, and make it yet more and more, what it has ever been, a tower of strength to the public service of the Great Empire of England.

Colonel FINDLAY, Highland Borderers Militia: With regard to the rival advantages of canvas, barracks, and billets, I have endeavoured to get information on the subject, but it may be imperfect. My impression is that with regard to canvas if you take the population of counties and districts from which militia regiments are drawn, when the regiments are put under canvas they are not so strong in proportion to their strength as they would be if in barracks or in billets. I agree that barracks are preferable to all the others. I believe many excellent men are deterred from entering the militia service through having to take the chance of the weather. For men taken from indoors or underground working that is a deterrent, but with regard to farm labourers it is no deterrent. That is a subject on which I should like to have some information. The limited information I have carries out my idea that where regiments are put under canvas their numerical strength is not so great as it is where barracks are provided.

Colonel INNES: In thanking you for the kindly hearing you have given to my lecture, allow me to express at the same time my conviction that the reading of the paper and the discussion by which it has been followed has very much served the purpose which I had in view. It has brought before you a number of topics of very great importance; it has led to the expression and exchange of views on these subjects, and I think it has led to the maturing of opinion on them. I shall not attempt to follow the various speakers in what has been said, but with reference to the various topics I had noted on the board, I shall give a general reply to the observations made. Before I do so, let me express my regret that the use of an unguarded expression has perhaps led to a misconception of my meaning, and to a discussion which is really not of very much importance. I used the expression

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[1] "No better exemplification of this could be than that embodied in the person of the gallant Officer I see seated opposite, and who has addressed us this afternoon. I can never forget the quickness, energy, and power with which, ten years ago, in a garrison I then commanded, Captain Colomb transmuted some hundreds of raw Irish lads into well ordered and well trained soldiers."

of "a happy medium between slackness and tightness of discipline;" by "a happy "medium," I merely meant the right thing. I agree entirely with General Herbert's view of the difference between an Aberdeenshire man and a Londoner, and that he possibly requires different treatment; but I am afraid if my defaulter book were to be examined, it would not be found that I govern my regiment entirely by kindness.

First, as to *the creation of a reserve*, that is to say, having a number of men ready to fill up the regiment when wanted, who have got leave from training. Allow me to say that that does not mean that any man who claims leave of absence from training shall necessarily get it. I have in my own regiment reduced it to a system. There is a certain certificate that he must produce from his employer; that certificate sets forth that his services are of great importance, and cannot well be dispensed with; and that certificate is vouched by a magistrate who knows the employer; so that these men who are allowed to be absent from training are men that I could put my finger upon at any time. Therefore I assume that I may say they are the best quality of men to form a reserve when required. There is no doubt that absence from training necessarily involves a certain amount of want of practice and getting rusty, but the same may be said much more strongly of the reserve for the army, in which the country trusts; they are not called up for any training at all. As to the *barracks for training quarters*, what I suggested was this: that the billet money is equal to 6½ per cent. upon the cost of building barracks, assuming that barracks can be built at 10*l.* per man. In suggesting that idea to you, it was not based on mere theory, because my own regiment is quartered in barracks on that principle. I had buildings which had been built by the county, which furnished barrack room for 500 men, and within the last year, quarters for 300 men have been added owing to the augmentation of the regiment; and the lodging money paid for the quartering of the regiment will, I have no doubt, eventually pay off the cost of these barracks. Of course that does not include the cost of building stores and other necessary buildings, which must be furnished by counties, nor the building of quarters for the permanent staff: that is quite a separate expenditure. But almost all counties have already large buildings, stores, &c., and many have got quarters for the permanent staff, and it would not be a difficult matter, having the interest of the money secured, to add barracks for the quartering of the men.

General HERBERT: May I ask if those barracks were built by the county lately?

Colonel INNES: The first barrack rooms were originally drill sheds built by the county in connection with building stores and quarters for the permanent staff. They were converted into barrack rooms about twelve years ago. The additional barracks has been lately built under the sanction of the county. The money is advanced on mortgage of the building, and assurance by the county that the sums received for quartering the regiment will be applied to the extinction of the debt. Then as to *the question of musketry instruction*. I am happy to think the views I have put forward have been generally endorsed by the Officers who have spoken. I am glad to learn, from what has fallen from some Officers, that it is likely that the system I have advocated, viz., the thorough training of recruits, will be carried into effect, and I trust that any very great employment of regiments during training in musketry will be abandoned. It is quite certain that the experiments made this year in that direction have proved an entire failure. I think with regard to those *special subjects* which I have suggested as subjects for extra training in successive years, rather too much has been made of the difficulty. Many things when spoken of in the lump, as it were, look much more difficult than when you come to analyse them. All I suggest is this, that these various subjects are all more or less necessary, and, at all events, as has been pointed out, if the men are not to be instructed, the Officers and non-commissioned officers should be instructed in them; that instead of attempting to crowd them all into every year's training, the time at disposal after providing for company and battalion drills should be devoted to one such subject in each year's training, and that before attempting this subject with the general mass of the men, the Officers and non-commissioned officers should be well got up in it. That seems to me to be a position which hardly admits of dispute. As to the extent to which it may be carried out, that of course admits of difference of opinion. In

some of these suggestions I beg to say I have been giving you the result of my experience, and I found I could carry out more than possibly might have been expected when I commenced them. As to the *training of Officers and non-commissioned officers*, I appreciate much of what fell from General Herbert. I trust that those schools of instruction in connection with brigade depôts, or with districts, which General Herbert alluded to as having been established at his suggestion, may be established generally in all the districts of the country, because I can see there is nothing more wanting at the root of any possible efficient training of militia regiments than a means of rendering the non-commissioned officers who are not on the permanent staff available for duty. They never feel confidence in themselves; they are not confident that they are thoroughly instructed and acquainted with their duty, and they therefore can never take the position of useful non-commissioned officers in the regiment. With these few remarks allow me to thank you for your kind reception of my paper.

The CHAIRMAN: I am sure there is no Officer in this room, and I believe there will be none in the militia service, who will not feel himself under a great debt of gratitude to our friend Colonel Innes for the faithful labour he has expended upon a subject involving an immense amount of study; and I am quite sure our friend will not be disappointed if, in a subject involving so many and various details, he finds that everyone of us is not entirely able to agree with him on every point. At the same time, I think he will also feel that the disagreements have been rather in form than in fact, some of them, I might say, almost verbal, such as the question of the character of the militiaman, which it is now universally admitted is subject to great varieties, each having his own peculiar and special excellencies, just as the regiments raised from the *gamins* of Paris have when compared with the stalwart peasantry of Alsace. Special subjects have been a good deal referred to, and some think they might be carried out to some extent, while others consider it impossible to do so in the too limited period at our disposal; but we are all agreed on their importance if it can be done; and I believe we are all agreed that it would be a very great improvement if, to a certain extent, each regiment had a certain number of instructed Officers able in the case of a permanent embodiment to carry on instruction in those particular subjects. It must be, I think, a matter of very hearty congratulation to Colonel Innes to find that upon many, and those the far more important points about our service, we are substantially unanimous. There is not a dissentient voice to his proposition that billeting is a most unsatisfactory system, and that barracks, so far as possible, should be substituted. There have been some objections raised about canvas, and of course there are different conditions affecting different regiments which must be taken into account, and as experience on these subjects is valuable, I venture to offer my own. I have some experience, for I have served eleven successive trainings in billets, and eleven successive trainings since under canvas. I serve in an exceptionally wet climate, and an exceptionally wet soil, and yet I am bound to say the health of my men under canvas has been excellent, the proportion in hospital being smaller than it used to be in billets; and I think it may be taken for granted that the discipline of the regiment is infinitely superior, and we get at least a half more work out of the men. With regard to the question raised as to whether living under canvas affects prejudicially the recruiting of the militia, I can only say my regiment is at present not only complete both in Officers and men, but I have a reserve list of young gentlemen waiting for appointments, and I am considerably over my strength in rank and file, having recently applied ineffectually to have the strength of the regiment increased by two companies. Another subject in which unanimity appears to be general is the subject of musketry; that at present the system is unsatisfactory, and that the new experiment of having a whole training once in four years for musketry is equally a failure. I think Colonel Innes has entirely carried the audience with him in holding that if the man is to be taught musketry effectually it must be done as a recruit. I agree with him most thoroughly, and I have practised it. I have for years devoted very nearly a fortnight of each recruit drill to musketry. I am bound to say the result is satisfactory, that I find the practice of the regiment very much superior to what I should have expected. I do not say that I make the whole of my men finished marksmen, but the great mass of them are able to stand firmly to their rifles and to

fire low and slow, and infantry who can do that will be formidable in action. I should wish, however, to see it carried out more systematically, and that a greater supply of ammunition should be issued by the Government to admit of the recruit training being carried out more thoroughly and fully than it is done. Again, I have the satisfaction of finding that we are unanimous on another most important subject, that is, the question of training the recruit—whether he shall be trained in his own regiment or with the brigade depôt.

I do not think there is a militia Officer who has ever studied the question, who has any doubt that the proper school for a young soldier to learn his study is his own regiment. We have already spent so much time in discussing this lecture, that I am unwilling to trespass longer upon your indulgence. I think we owe a debt of gratitude, not only to our able lecturer, but also to the two General Officers[1] who have done us the honour of coming here to-day, and have given us the benefit of their experience and advice. It is most gratifying to hear the terms in which both those gallant Officers have been kind enough to refer to the service to which we are happy to belong.

With regard to the extra subjects on the board, I can only say I have always held that the rank and file of the militia are fit for any service if they are well commanded, and the *cadre* of the regiment is fit and complete. I therefore wish to see public attention directed as far as possible to improving the training of the militia commissioned and non-commissioned officers. The amount of zeal that militia Officers display in learning their duty does them the greatest possible honour, and I am sorry to say the opportunities given them of learning their duty fall very far short of what they are entitled to. An Officer in the line, after he has gone through a careful course of instruction, has open to him the School of Musketry, of Signalling, the garrison course, and a variety of means of improving himself in his professional knowledge; but to the militia Officer all these are closed, with the single exception of the School of Musketry, the doors of which are open only to a very imperfect extent. I think some steps should be taken to afford militia Officers an opportunity of attending these courses, and especially the garrison courses. While we hope the Government will extend more liberal terms to our service, I am sure we all feel that what we have to depend upon mainly for improving it, and increasing its reputation, is what we can do ourselves, and I think we may look forward hopefully to the future. When I consider what the militia was when I first joined it twenty-six years ago, and what it is now, I see no reason to be discouraged, and can remember when the only training of the militia was for twenty-one days, without any preliminary training for the recruit, and the recruits had to be hustled into the ranks as best they could during those twenty-one days. I can remember when there were only thirty-nine subalterns for the whole militia of Scotland, and I am sorry to add that the services of a good many of those thirty-nine could have been very well dispensed with. The militia occupies a very different position now; and if anything had been required to strengthen the confidence I feel in the service, I should have gathered it from seeing the large assembly of militia Officers, which has met here at this inclement season to listen to Colonel Innes's paper. I think we may look forward confidently to the militia having before it a future of usefulness and honour to this great country; and the next time it is called upon for permanent service, be it soon or late, it is in a position to render services even more important and more eminent than those which in times gone by earned for it the confidence and the gratitude of our country. I beg you to join with me in returning a most cordial vote of thanks to Colonel Innes for his very able lecture.

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[1] Generals Herbert and Lowry.

Friday, February 4, 1881.

COLONEL SIR LUMLEY GRAHAM, BART., Member of Council, in the Chair.

THE OFFENSIVE-DEFENSIVE BY INFANTRY IN EXTENDED ORDER.

By Colonel T. LYNDEN BELL, 37th Brigade Depôt.

THE privilege of appearing before this meeting to-day has, as regards myself, two aspects, one (although it may appear like "begging the "question") involves some hesitation lest the proposals which I have to make should be considered too simple to be effectual, the other giving encouragement because of the importance of the subject and the hope that valuable discussion may take place regarding it, so that the general result may indicate some definite and plain principle by which infantry in extended order shall be enabled to hold a given front against the enemy with even greater stability than can now be commanded by larger numbers acting according to existing routine.

I will proceed in connection with this subject, first, to state what now seems to call for change, secondly, what is proposed as an amendment, and, thirdly, my reasons in support and other considerations bearing upon them.

Having in view the eventful circumstances of the Zulu and Afghan Campaigns, it would appear to have been generally found impracticable or impossible to retain infantry sufficiently long in extended order to break the force of rushes of irregulars or fanatics against the main body, and that in consequence of this recognized difficulty the attempt was, in some instances, never made, and the infantry were kept in close formations, having an outlying safeguard of cavalry only.

The wisdom of this was justified on some occasions, but on others the result was disastrous, and it seemed to depend on the quality of the troops engaged, whether it was the one or the other—that is, successful or unsuccessful. It was a retrograde measure to meet the condition of things at the time, proving that men extended (as at present) could not keep their ground against the rushes of the masses brought against them. Had we, however, been opposed by any but a savage or undisciplined foe, without training in the use of modern arms, without field artillery or powers of manœuvring, we must admit that to fall back upon the conduct of battle before the introduction of arms of precision and long range, would have been a fatal mistake, and it may be possible for us to meet at any time armies of superior strength which can combine the rush we could not

effectually resist, with the subsequent discipline which could render it so dangerous an opening to an action.

It appears, therefore, evident that be our enemy disciplined or undisciplined, something ought to be devised to give greater *tenacity* to the cordon of infantry *covering the real force* which a General should be capable of developing according to his plan of battle, and rely upon for ultimate success—so that no wave of the kind, by breaking directly upon that force, may cause disorder and prevent deliberate manœuvring to carry out his object.

I venture to propose that instead of the fighting or skirmishing line, thrown out as a covering body in advance of other troops, being in single rank when firing, it should at the halt, and whenever halted, form quadrilateral figures of fours (see Diagram No. I), the left files forming on the right. This gives a line of squares of fours which support each other mutually, with one man in reserve for each four.

Secondly, that when reinforced from the supports *for the purpose of resisting attack* the reinforcements should form into fours on the fours of the first line; making a very strong offensive-defensive chain. (See Diagram No. IV.)

The men should be in the lying down position, and turn the body only in the direction required to deliver the fire.

The half-battalion in reserve (to adopt as example a battalion only) could, under cover of the chain formed by the reinforced line, act with advantage in close files against any infantry or cavalry who might bring extra pressure to bear on parts of the line, or who might have broken through or partially turned it.

It may be further remarked that men disposed in squares of fours can fire in any direction—that no intermediate movement is necessary to prepare for cavalry—that reinforcement by the supports not only gives great additional strength but does so without loss of tactical unity by the company or party supporting.

The nature of the grouping also is such as to give confidence, whereas in a single or even a reinforced line of skirmishers none is felt, the men themselves being aware of its weakness for resistance, and that they must make another formation for refuge whenever cavalry is likely to act against them.

In squares of fours their duty is to shoot steadily and hold their ground, feeling that the reinforcement of the supports makes them doubly strong, and that the reserve companies will be brought up to give further aid when the necessity arises.

It may be said that such groups or squares of fours would be a large mark for artillery, but the men would be in the lying down position at double (or more than double) interval in their normal condition when firing to the front, and if an attack by cavalry, skirmishing infantry, or irregulars were being made, it should be impossible to employ artillery against them.

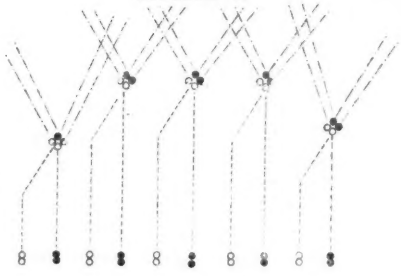
It is contended that if such a rush be checked, opportunity is given for more offensive counter action, and it is reasonable to think that when infantry see that they are well posted for resistance they will not be subject to that uncertainty of mind which may lead to panic.

THE OFFENSIVE-DEFENSIVE BY INFA

EXPLANATION OF DIAGRAMS.

Left files are shown thus ... ○○
The crossing fire shows the extreme lateral range; most of the fire would be directed to the front.

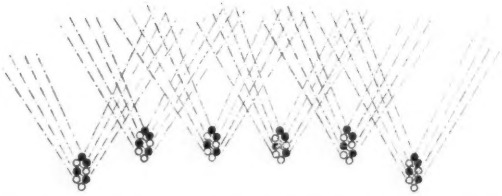
DIAGRAM 1.



Advancing skirmishers, forming squares of fours at the halt, and lying down.

The rear fil
so as to bring

DIAGRAM 4.

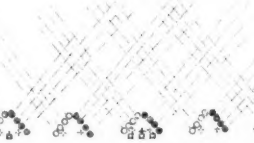


Squares of fours re-inforced by the supports in similar squares.

DIAGRAM 5.

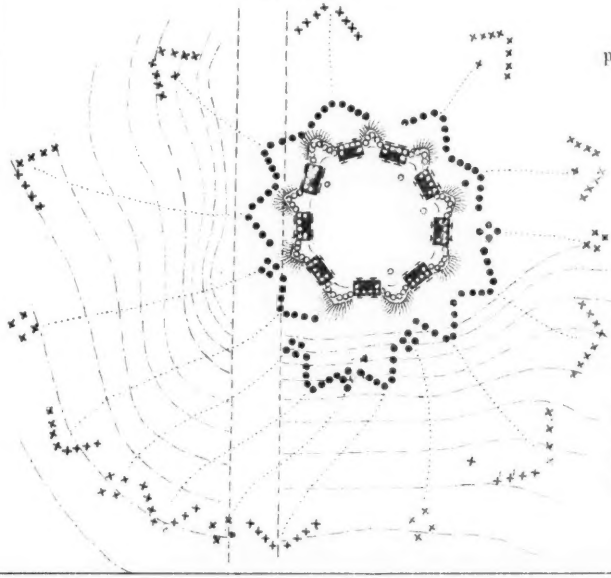
(1.) Line of squares of fours pre
re-inforcement.

(2.) Prepared to receive re-info
in the broad arrow formation.



(3.) The re-inforcement by suppo
plete in broad arrow formation.

DIAGRAM 7.



REFERENCE—DIAGRAM 7.

× × × × × × — 1st *Position.*
● ● ● ● ● ● — 2nd ———
○ ○ ○ ○ ○ ○ — 3rd ———

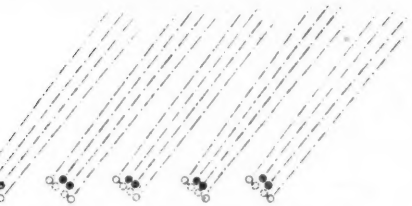
Formation of defensive post w
wagons, covered by half the deta
ment thrown out in broad arrows.

GENERAL NOTE—The four C
panies acting as Regimental Res
behind the cordon of skirmishers
supports are not shown, though es
tial to carrying out the system.

Harrison & Sons Lith. St Martins

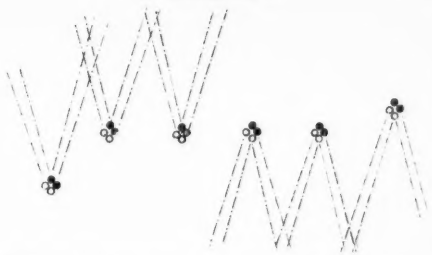
BY INFANTRY IN EXTENDED ORDER.

DIAGRAM 2.



The rear files—of squares—opening out so as to bring every rifle to bear to a flank.

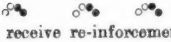
DIAGRAM 3.



Showing how fire could be directed to front or rear.

GRAM 5.

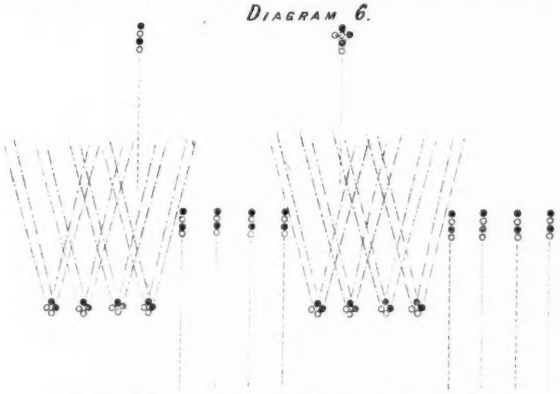
res of fours previous to



receive re-inforcements ormation.

ement by support com- formation.

DIAGRAM 6.



Advances by rushes of four alternate sections of fours.

—DIAGRAM 7.

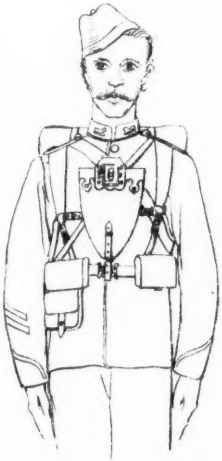
1st *Position.*

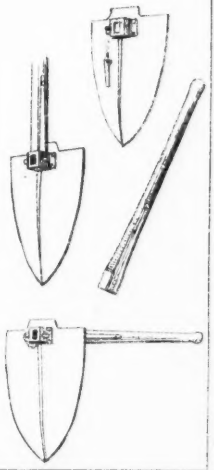
2nd _____

3rd _____

efensive post with y half the detach- broad arrows.

—The four Com- Regimental Reserve of skirmishers and wn, though essen- the system.





Stone Lith. St Martins Lane W.C.

Prior to the advance of the fighting or skirmishing line (should such be required) after repulse of an attack, it would only be necessary to supplement it by some of the squares of fours from the supports so as to fill gaps, &c., and the supports themselves could get into single rank or files, and follow at supporting distance, taking advantage of cover. To retire the supporting line, after having repulsed an attack and supplemented the first line, would also be a simple matter of drill, viz. :—supports, retiring at the double, forming files (or single rank) on the march—covered by the fire of the fighting line.

There is a clear distinction between the foregoing and the formation for attack, the manner of conducting which, being provided for by regulation, does not come within the scope of this paper; but there is nothing now brought forward to prevent its being carried out, as already proposed, in connection with a flanking movement, while the front is held by our defensive chain, or (as perhaps an extreme measure) by an advance through the intervals of the chain itself, to which it could give support, by being pushed forward, following the attack, and intrenching itself at the points formed by the squares of fours.

As a last alternative, the covering troops forming the chain could be ordered to advance as the head of the attack.

To revert. One very important question seems to arise, viz :—In what manner can the largest frontage be held in the strongest way by a battalion of infantry, furnishing its own supports and immediate reserve, in opposition to a skirmishing or other attack, or for the prolongation of a flank to resist a threatened turning movement? (in connection with Gatlings, or artillery, or cavalry, if available).[1]

I have with great deference ventured to propose one solution of the difficulty. Perhaps other Officers may think it worth while to give the matter the benefit of their professional experience with a better result.

It is necessary to explain, with regard to the apparent similarity of the formation which I advocate to that contemplated by Par. 11, Section 26, "Field Exercise Book," that the latter is a refuge against cavalry from an untenable position, and that the very fact of being obliged to take it up under pressure unsettles the troops and has a tendency to make them unsteady; moreover, such groups, as a rule, at once come to the "prepare for cavalry," and firing must slacken.

What is fatal in the line is common to it when reinforced, namely, its inability to resist a flanking dash of cavalry, and to form groups, after casualties have occurred in the single and under any circumstances in the reinforced line requires organization by the Officers or non-commissioned officers on the spot, and is, I contend, essentially different from the deliberate adoption of the order of squares of fours, which arrangement provides for ordinary firing, for emergencies without being shaken by change at a critical moment, for reinforcement

[1] Gatlings could be worked between the groups of infantry in the first line.

without loss of tactical unity and by making right and left files really "comrades in the field," turns to account their previous association, and mutual confidence *before* the moment of danger.

It may possibly be said that it is open to question if the supporting squares of fours are well placed, so as to give their fire.

As an alternative in this case, it is easy to form a *broad arrow*, the four men of the fighting line being at the apex (two on each side), the supporting four prolonging the sides (two on each), and the Officers and supernumeraries filling up the enclosed space, in rear; tactical unity is still practically maintained by the deliberate placing of the reinforcement in a certain temporary position for a certain object, but it is not admitted that the supporting squares, as shown in the diagram, cannot fire effectively.

It is quite possible, with the "intrenching tool," of which diagrams are submitted herewith, for men in the kneeling position to make good cover in a short time for the group of fours; two men of each working in rear of the other two, who might keep up fire.

The men should use the tool as a hoe—on such an occasion pulling the earth towards them with the blade after striking and then pushing it forward with the reverse side, working on their knees—when necessary to give impetus to the stroke.

Here it may be incidentally remarked that cover for groups is much more easy to make and more practicable under difficulties than a continuous shelter-trench: a rise of ground here or there may be improved so as to afford protection, and the levels avoided as much as possible.

The tool was forwarded to the Horse Guards by me on the 11th June, 1879. It might be made of any convenient weight, the handle could be carried by one man, the blade by the other. It forms a spade; it can be used to fire through in a shelter-pit (having a loop-hole), and the blade acts as a shield when worn on the breast; it is a tool for the skirmisher; and although otherwise useful, has its chief merit in its adaptability to the condition of troops who are exposed to fire, and who require to make cover so as to fight more effectively.

The intrenching tool, as will be seen by the diagram, can be carried without in the least interfering with the performance of any field duty. The instrument forwarded for the inspection of His Royal Highness was not as perfect as I could have wished, but the manufacturer would have made others so if I had been in a position to order them.

Permit me to introduce into the infantry scheme of such battles as Ahmed Khel and Maiwand the proposals which I have brought before this meeting, in order to show how they would have fitted in with those occasions, and whether their employment would have been beneficial.

I do not presume to offer any criticism upon the actions themselves, but merely take them as examples, in the manner that might be done if the troops engaged were pieces in a war game.

There were several points in which the conditions were similar, some in which they were essentially different; the results were, of

course, different. Both were fought by a British brigade of all arms against an irregular force superior in numbers. In both the actual initiative was taken by the enemy, who on each occasion attacked the front and both flanks.

At Maiwand the enemy had a preponderating artillery force, at Ahmed Khel he had none.

At Ahmed Khel the situation at the critical period of the action, when the flanks were attacked as well as the front, appears to have been this. The infantry having been in the attack formation had reinforced the fighting line and absorbed regimental supports and regimental reserves. There was one battalion in reserve, two companies on escort, the cavalry was partly unshaken, the front was unbroken, the right front was thrown back to resist pressure on that flank.

At Maiwand the infantry was in line, with the right partly thrown back; a portion of the front was shaken, as also the cavalry, by artillery fire, and there were no reserves.

At Ahmed Khel the repulse of the flank attacks, which appear to have penetrated behind the right and through the rallying squares of the left battalion, seems to have been due to fire directed to the rear by part of the front line, and to the reserve troops including the escort, as well as the cavalry; in fact, speaking generally, to the reserve with the partial co-operation of the front line.

At Maiwand, the troops of the front line and the cavalry were not, for the reasons stated, able to offer effective resistance.

If there had been a strong hostile artillery on such an occasion as Ahmed Khel, the reinforced line with supports and regimental reserves absorbed would have suffered more, and would therefore, it may be assumed, have been less in hand (independent of the amalgamation caused by reinforcement) to assist the reserves in repelling the attacks on the flanks.

Had the situation been a converging attack on the front by irregulars, combined with a frontal artillery fire (as long as practicable), and turning movements more directly on the flanks and rear, opposed on our part by a line reinforced by supports only (the regimental and other reserves being unabsorbed), would the fighting line reinforced partially be as competent to meet the converging frontal attack of a mixed force in rallying squares as it would be if disposed in the mutually flanking "broad arrow" formation, which allows of the fire not being slackened under any circumstances? With the system I advocate, the actual absorption of regimental reserves would not take place in repulsing an attack, as after action by them, they would still retain their tactical unity, always keeping behind the fighting line, and be available in part wherever the pressure might be greatest, either in front or to the flanks.

Again, would not the *fire* of a line of reinforced squares of fours or "broad arrows," be equally, if not more effective, than that of a fully reinforced line which is so likely to become overcrowded, and which, from the fact of there being double the number of rifles, would, in

proportionate degree, be prevented by the hanging smoke from seeing the objects fired at?

It is not reasonable to expect that a line fully reinforced and subject to artillery fire or other attack, could be able to reorganize itself into its tactical units, so as to withdraw quickly and effectively a portion for the purpose of repelling a turning movement, therefore, it ought to be perfectly clear that regimental reserves should never be absorbed except at the crisis of an attack on the enemy, and not even then, if no other effective support or reserve is at hand, when a flanking rush is possible.

To turn to such events as took place at Maiwand, applying my system, there would have been half the infantry in the position of reserve, support, or second line, whichever term is most suitable, half in the firing line. The reserves, although unable, from the conditions under which the battle was entered upon, to turn defeat into victory, would have checked the flanking advances for the time, and have enabled the guns to retire, covered by the infantry of the first line, which might have retired by alternate bodies, and having, by reason of the action of the reserves, less flanking pressure upon them, might possibly have been concentrated during retreat, and been able to pull themselves together, so as to show a front at a little later period, and cover the retirement of the reserves.

Convoys.

I desire to add a few remarks as to the manner in which the tactical order of groups or squares of fours seems to commend itself to such situations as the escorting of convoys. In the first place, the holding power of the infantry of the advanced guard or party would be materially strengthened, because two-thirds, if not one-third, might not only be reasonably expected to make a stand on a broad front, but also to inflict loss on the enemy, while the remaining portion would be free to act behind them in opposition on the development of the attack.

This applies equally to the rear-guard, and indeed to all advanced and rear guards.

The flanking parties, holding the place of outlying skirmishers with regard to the main body, which would be generally placed about the centre, would act similarly, being supported to give time for concentration.

The men, scattered, as they so often are, along the line of route, should be kept in parties of fours, moving off with the carts at intervals. They would thus be in a better position if required to assist on the occasion of break-downs or stoppages, and be more capable of taking care of themselves under any circumstances.

Here I would observe it is assumed that due precautions have been taken as to scouting well to the front and flanks of the convoy with cavalry or with the best means available, without which it is impossible to prevent surprise or defeat. Taking this for granted, also that notice of danger and probable attack have been given, and preparations to meet the same ordered, the delaying power of squares

of fours, with small reserves to back them up, ought to give confidence and facilitate the closing up of the carts into parks on three points of concentration most suitable for protection by, or refuge for, the three principal parties with the convoy, which, in its normal condition, were posted at the head, at the centre, and to the rear of it; according to rule these points ought to be within supporting rifle-fire of each other. It would, in such a case, appear wise that a proportion of the reserve ammunition, water, and provisions should be previously told off to each of these possible divisions, so as to be at once available in case of eventualities or temporary isolation.

The men detached along the line of route should be kept on the same side as the carts, and every four or five parties of fours be under distinct command, so as to be in hand, and capable of acting unitedly by order and in order.

Every moment of delay between the direction as to parking at the points of concentration and the actual attack, must draw together the units of defence and improve the prospect.

We have so small an Army, that the employment of weak detachments under circumstances when the desirability of larger ones would be consistent with prudence, is often a matter of stern necessity to prevent collapse, therefore, it has been my earnest desire to point to a system which would, in my belief, enable—or tend towards enabling—such parties, when not without water, ammunition, and provisions, and when the elementary principles of reconnaissance and scouting have not been neglected, to make in a few minutes, with the assistance of intrenching tools, carried by themselves as part of the equipment, not only that resistance to attack by superior numbers which British soldiers always attempt, but one most likely to have a successful result.

I invite attention to a diagram, No. VII, representing a detachment in charge of a convoy (or part of one) having thrown out some of the men in the "broad arrow" formation for the protection of the remainder while forming a defensive post with their wagons.

In anticipation of certain questions on the general subject brought forward, which might require more careful consideration than could be given on the spur of the moment, I have noted down a few possible queries calling for information which has not been elicited, with my replies.

Question 1.—How would you advance a reinforced line of "broad "arrows" to a better position, under fire, but not otherwise opposed?

Answer 1.—The men of the first line could advance by alternate rushes of four sections of fours as shown by Diagram No. VI. The supports should remain lying down until the fresh position had been taken up, and then reinforce by rushes in single rank, and form as before.

Question 2.—How would you retire a reinforced line of the same sort, under fire, but not pressure?

Answer 2.—The supports should first retire in single rank, covered by the fire of the front line, and form the points of fresh arrow heads on the ground chosen. The front line should then get into single

rank (without rising to the standing position) and retire by alternate men (front and rear rank) according to regulation, keeping up fire until near the new line of resistance, when they should rush to the rear and form on the supports.

Question 3.—How would the supports be placed before reinforcement of any kind?

Answer 3.—In single rank extended lying down within supporting distance, under cover if possible, and the nearer to the front the better, provided there be cover.

Question 4.—How would you, in the first instance, dispose of the half-battalion in reserve?

Answer 4.—After sending out the four leading companies (or leading half-battalion) from quarter-column, to take their places as first line and supports, the reserve half-battalion, might form "fours "left," be wheeled to right, open to double company interval from a central company, halt, lying down in columns of fours (the left four leading). But it would be undesirable to tie the commander to any fixed position not favoured by the ground, his object being to get within striking distance, and yet be covered as far as possible from fire.

On reinforcement by the supports he would make a corresponding advance with, say, his two centre companies, front forming, and moving forward by rushes, to any cover which might admit of his being nearer to his objective.

Question 5.—How would you act in case of a partial breaking of the reinforced line by a body of the enemy?

Answer 5.—I should bring up a company, with fixed bayonets, at open files with sloped arms at the run, cheering, and (having previously cautioned the men as to what I intended) should halt and deliver fire (one round) at fifty paces, then charging with the bayonet. This should be followed up by another company, kept together with all the steadiness and control possible.

(I beg to observe that this is merely suggestive, and firing would be conditional.)

Question 6.—Would you employ all your reserve companies to repel an attack?

Answer 6.—No; it would be best to keep one company still in reserve, to form a rallying point in case of retreat or an attempt to turn a flank; but if the battalion were on a flank, special arrangements would have to be provided to meet such a contingency as the latter.

Question 7.—How would you arrange that the regimental reserves should be at hand to repel an attack?

Answer 7.—Whenever notice was passed of an approach, with a view to force the line, the companies of the reserve disposable for the purpose should close up, if necessary, to within striking distance, in the most stealthy manner and so as least to expose themselves.

It is assumed that the enemy's artillery fire would slacken if there were a movement in direct attack covering the front.

Question 8.—How would you act in the event of a strong organized attack being observed to be in progress against your fighting line?

Answer 8.—(1.) Notice should be sent to the Brigadier or General Commanding the division requesting any reinforcements available;

(2.) The position should be held as long as possible, acting in accordance with the principles already set forth;

(3.) The front line, under ordinary circumstances, should, on taking up its position, have at once commenced with half its strength to make cover, and it is assumed that cover would be provided in part, if not altogether, for the "broad arrow" formation, by the time of the development of the attack;

(4.) Part of the reinforcements sent by the General should take up a covering position in rear, retaining a support. The original reserve company would be liberated and added to any further available men who would be pushed to the front;

(5.) Gaps should be left in the formation of the reinforcing troops pushed forward, so as to admit of the men in front rallying behind them if driven back in confusion.

Question 9.—How would you retreat under pressure of such attack?

Answer 9.—(1.) Part of the reinforcement would be in the situation suggested in paragraph 4 of the previous answer.

(2.) Part of the troops contending with the enemy should be withdrawn, if possible, into position in further support of the second line.

(3.) The men actively engaged, and being driven back, should be impressed with the fact that a supporting line was already established, so that when forced to do so, they might retire behind it, and take up a fresh formation in rear.

(I think it will be allowed, that such a question as No. 9 is a difficult one to answer under any circumstances, and that success cannot be assured by any system whatever. I ask your indulgence on the point.)

Question 10.—How would you throw back a flank to meet a turning movement, being in the "broad arrow" formation?

Answer 10.—The outward flank should have been strongly posted to begin with, and thrown back in échelon, with a special force in support and reserve, so as to cause the enemy to make a détour or else expose his own flank.

This would be a favourable time for the employment of cavalry and artillery, or machine guns.

Any available reserve troops should be brought to bear to support the exposed flank.

As a matter of mere drill, if time and circumstances permitted, a reinforced line in "broad arrows" could form two lines in files, or in single rank, and throw back a flank on fixed points at the double, re-forming afterwards.

I have ventured, in a simple form, and in an unpretending manner, to deal with this subject, without raising it to the proportions it would assume if applied to large bodies of troops. If the principle be accepted as meeting the necessities of smaller forces, the battalion unit can be multiplied and modifications take place to fit in with other tactical essentials.

By entering into minor details, some of which do not materially affect the question, I am aware that I am laying myself open to refutation on many points, but I say, with deference, that so long as details are not arrived at by someone, so long will general vagueness continue, and a difficulty exist in applying practically to the condition of our army what may possibly suit in every way the different and larger organizations of other countries. I therefore throw myself on your consideration in a good cause.

I submit that it may be found generally serviceable and useful in the circumstances of a campaign to have the power, in any ordinary condition of ground, to establish at once a defensive chain which may be moved onwards or backwards, which can be prolonged to a flank, be quickly intrenched at points if desired, which covers a frontage and protects, to a considerable extent, the direct line of retreat; which gives, as it were, a fresh movable and approximate base (on a small scale) from behind which the offensive can be taken at an opportune moment upon the enemy, if he advances on the front presented to him.

I also hope it will be seen that a proportionate front can be made strong, and possess great powers to inflict loss by fire, particularly when joined to machine guns, with half the available force, liberating the remainder for the offensive and for general reserves; that the chain does not lose tactical unity as to companies while on the offensive and unforced, and that, consequently, the battalions forming it can be quickly brought into hand, when required to take their places in any field operation to which change in the conditions of the engagement may point.

Colonel G. H. MONCRIEFF, Scots Guards: I only wish to ask one question. I do not quite understand why all the fire is crossed and not straight to the front of the men engaged (as shown in the diagrams).

Colonel BELL: The crossing was to show what would be brought to bear upon a certain frontage at a certain time; but, of course, the fire is intended almost entirely to be to the front.

Lord MARK KERR: The fire section of fours across would have the same effect as —a more killing one probably than—firing to the front. I was not prepared for what the lecturer has brought before us. It is entirely a matter of defence, and that is one of the most difficult parts of skirmishing drill. It is hardly the meaning of open order fighting, and never has been tried with success. What the lecturer says is very true, that it is a matter for detail and practice, not for talking about much. He has said all that can be said, I think, in favour of it, and what he has said is very true and good. The great aim of skirmishing drill is for attack, and I do not think it has been tried in retirement, except in the Franco-Prussian War, where it never was successful. Both Germans and Frenchmen retreated and got more shot, the further they went to the rear. The subject of retiring steadily in skirmishing order before an overwhelming enemy is, however, a very difficult one to grapple with in theory, and in war it is probably impracticable.

Captain COCKBURN, late 42nd Highlanders: This is a subject in which I have taken great interest, and more than twenty-two years ago I heard a friend of mine snubbed for having the audacity to suggest something similar to what has been now suggested about the power of receiving attacks in open order. What he then said was—and it was only a civilian that saved him from being sat upon by military men around him—that tactics were so thoroughly commanded by weapons, that since the introduction of the rifle he considered the whole of our old close order and double

rank tactics should be done away with; that the British square was the most terrible piece of folly that could possibly be adopted with our present weapons, and that it would have in future to be a square of skirmishers, 1,000 men covering 1,000 yards of frontage, the men ten paces apart and ten deep, in échelon ten paces behind one another. I heard him say that he considered the days of large masses were past; that he believed, and he thanked God for it, there was stuff in Old England yet: that we could teach men to lie down and sell their lives dearly. That would make victories over men in close order by men in open order advancing on them so terribly expensive that victories would be worse than defeat. It was in remembrance of those words of my friend, that I came down here to listen to this lecture, which I hoped would have explained what my friend then suggested, and what was pooh-poohed at the time, but to a certain extent has been adopted since.

Lieut.-General A. HERBERT: As no one else appears inclined to make any remarks, I take the liberty of adding my testimony to what I consider the ability of the lecture that has been given. I am well known to have been for years a supporter of open formation. I think, however, that the necessity for those formations depends on the enemy to whom we are opposed. In Zululand, in Afghanistan, and in different wars where we were not opposed by trained forces, or by regular disciplined armies, the extended formation was not in the same way required as when we are opposed by regular forces with arms of precision, as long-ranging ordnance, in which case it is absolutely necessary, if any frontal attack is to be made, that the troops must be to a certain extent in open order. Whether the formation is by files in single formation, or, as recommended by the lecturer, in fours, does not to me appear very material; but there can be no doubt that for the defence of a camp the formation recommended by Colonel Bell appears admirable. In wars with savage forces, where we always have opposed to us at least three or four times the number of men we can bring against them, we must be invariably prepared for an attack all round, and it was in that formation the troops in Afghanistan constantly moved. They were always prepared for an attack everywhere, and I believe for that reason they were successful. With regard to the fours being a defence against cavalry, I believe cavalry would ride over them just as easily as they would over files. Perhaps the broad arrow formation might have a little more effect where they were supported; but this is a formation that we can always drill our men to; it is only adding two little items to the instructions in the drill we have at present. I see nothing in Colonel Bell's lecture opposed to the present system of drill, it is merely a suggested improvement on it. With regard to intrenching in attack, I am afraid very few men would be inclined, if they made a hole and got into it, to move on. From what I have seen and read of men in action, I have always observed that when once they lay down and stopped, it was difficult to induce them to advance; therefore I should be very wary of teaching men to intrench in attack, though on some occasions it might be advantageous. As a rule, I do not think that attacks should be made by advancing with intrenching tools. Again, in retiring, I believe every one who has read and considered the question knows that under the present heavy fire men cannot retire steadily; they will always run until they come to some firm, formed body, where they can rally; and the great art we have to consider is to endeavour to teach men, when they retire, to be accustomed to be rallied quickly. I think that can be done, especially if the formed body on which the men retreating are to rally had intrenched themselves. I have found it perfectly possible at manœuvres to mix up regiments and in a few moments re-form them, by drilling men to rally rapidly on their Captains in all sorts of formations, either advancing or retiring, and re-form; but I do not think a force which has failed in an attack can retire by sections or in any given formation. It must skedaddle up to a certain point and then re-form. Many of the suggestions made by Colonel Bell are well worthy of consideration, and so far as I can see at present, some of his suggested formations may be on occasions very useful.

The CHAIRMAN: I think Colonel Bell has given us a very interesting lecture, and as General Herbert has said, I am sure there is a great deal in what he has told us. There were a few things which occurred to me on which I should like to ask him some questions, and first of all with regard to these fours. It appears to me the formation by fours is rather small. Colonel Bell dwells a great deal on these fours being comrades, and in the habit of acting together. Casualties would very soon

disturb that comradeship, and you would have a fresh grouping of fours of men who were not comrades. I think after the first action there would be a good deal of disturbance of the moral effect of grouping fours. Fours appear to me too small a group to work together. You cannot have a responsible man to command each four. If you adopt the larger groups that they have now in foreign armies for skirmishing purposes, you appear to me to attain the object better. In all foreign armies when fighting in extended order the men are formed into groups under separate leaders; each group leader is responsible for the action of his group, and as many as eight to sixteen groups in a company you may perhaps get responsible men to command them, but you would not get responsible men to take charge of the far greater number of fours. I do not see why the formation by fours in skirmishing line should give greater power of resistance than the usual formation. The fighting line can be reinforced as it is now to any degree. In fact, we know the rule is if you are attacking at the final moment, the line comes to very much the nature of a line in close order by perpetual reinforcement that makes it strong enough for all purposes. With regard to resisting attacks of cavalry, we are taught now that good infantry in extended order need not fear any ordinary attacks of cavalry. They may remain extended, they need not assume any closer formation, particularly if they have any advantages of ground. There are cases where cavalry may attack in very large swarms and come on very boldly when it may be advisable for infantry to assume a denser formation, to form rallying squares or company squares; then I think these squares would have more resisting power than either the fours or broad arrows, and with such a number of little formations they would be firing into one another very much, or at any rate would interrupt one another's fire. You could not expect them to be all dressed well in one line, or neatly in échelon, they would be all dotted about, and it would be very difficult to avoid firing into one another. One paragraph in the lecture seems to imply that skirmishers must always run into some formation when threatened by an attack of cavalry; but that we are told is not necessary, and it was proved not to be necessary in the war between Germany and France in 1870: both at Beaumont and Sedan there were instances of Germans receiving very determined charges of French cavalry in skirmishing order without forming squares. With regard to the groups, I think we may take warning by the example of foreign armies. They all had these groups of fours for some years, Germans, French, Russians, and they have all given them up and taken to the larger groups. The Russians had groups of fours during the war of 1877–78; at the end of the war they gave them up, and they have now no such formation as groups of fours. With regard to the tool Colonel Bell mentions, I should like to make a remark. I think as he says, it is a most desirable thing that every infantry soldier should have a tool, and that tool should be carried by the men, and not in carts or on pack-horses. Then I think it is important that whatever tool is carried should be complete in itself, that it should not be so that one man has a handle and another man another part, otherwise you would find it difficult to get the parts together when required for use. To what extent the tool should be used is another question. Many people seem to object to use it much lest it be dangerous to the *morale* of the troops. Officers must, of course, take care not to demoralize their men by over-intrenchment, but there is no doubt in many cases troops would be saved, and success insured, by having the power of intrenching. During the late war between the Russians and the Turks, the poor Russian soldiers in attacking the fortifications of the Turks had to dig out the earth with their finger nails and mess-tin covers because they had not any tools available. I see on the diagram the broad arrows disposed like a succession of little Redans all round covering the camp. That, no doubt, would have the effect of giving flanking fire. But supposing the enemy were firing, it appears to expose a great number of points to enfilade. It appears to me that that formation would not be wise under fire, though it might be very wise against an enemy who had not firearms, or who did not know how to use them.

Colonel BELL, in reply, said: Lord Mark Kerr, by his remarks, seems to imply that this plan had to do entirely with retirement. I did not intend it to be for retirement only; my object was to make the infantry in extended order *stand* under such difficulties as they would not now in extended order be able to resist; and, as I said in the concluding paragraph, I thought it would be serviceable in a campaign

to have the power to stop an unexpected attack by the enemy with the line of extended troops while you are able to pull yourself together. It may be said that these things do not occur, but, unfortunately, we know they do occur continually, when troops find themselves in action much sooner than was anticipated. Then, I say, throwing out a stop, making cover with it, and having a distinct reserve to back it up, would give time, at any rate, for a General to take whatever action he may think desirable. I know that the four-formation is small; I quite admit that; and I see the force of what Sir Lumley Graham said. But I have built upon the fours because it is a well-known formation in the British Army; it is a thing we all understand. If I had to begin the paper again, I should only adopt the broad arrow formation on reinforcement, because it can be always closed in rear in case of necessity. My idea with regard to fours was due to its being such a well-known thing, it would be more easy to alter it in a certain way to make it useful than to bring in a startling novelty. The same thing applies to what General Herbert said, that the alterations that I propose are very slight; but I think that no person can hope to succeed in making amendments which involve changes of a very abrupt character, and I thought it would be easier to build upon what we have.[1]

The CHAIRMAN: I am sure you will all join with me in thanking Colonel Bell for the interesting lecture he has given us.

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[1] I wish distinctly to state that I do not place the actual "attack" in a secondary position of importance; my efforts have been directed, in a great measure, towards paving the way to it.

To give an attack practicability, it ought to be directed against the weakest part of the enemy's position, without exposing oneself to successful counter-attack, involving danger to the line of retreat or any essential point necessary to preserve it; for these very reasons, the principles of my defensive movable fire-line are advocated, leading, as they do, to choice of point of aggressive attack while holding a front.

The abandonment of the fours in foreign armies for a larger group, although I understand it to be applied to moving in attack, involves more cohesion to a small centre, more exposure to fire from there being less likelihood of cover, less extension between men, greater encouragement to independent action (which latter may be of questionable advantage, particularly if the group leader falls).

In our fours or eights there can be no dangerous individuality. In foreign armies they seem to begin by independent rallying round the Officer. We hope to pass into the last stage of attack before that becomes essential.

An Officer remarked that he would have liked the important point of the ammunition supply to have been touched upon. With regard to this, I have only to say that, if the regimental reserve ammunition and transport for it are under the control of the regimental commanding Officer, he is responsible that the men take into action, in *the valise*, a reasonable quantity not broken up, and that, when this begins to be drawn upon, more care than ever should be exercised by Officers and supernumeraries as to its control. I would suggest that, on each packet of ammunition, a short warning should be printed, such as: *Be careful not to fire away all your ammunition.*

Friday, February 11, 1881.

LIEUTENANT-GENERAL SIR GARNET J. WOLSELEY, G.C.B., G.C.M.G., Quartermaster-General, in the Chair.

ON ARMY TRANSPORT.

By Lieut.-Col. C. R. SHERVINTON, Deputy Commissary-General, h.p.

THE importance to the Army generally of the subject regarding which I am about to address you, will I trust plead my excuse for venturing to appear before you and attempting to express the convictions which a long experience in the Transport Service has forced upon me, after having given the question a careful study in its various bearings, both as affecting the issue of Commissariat and Ordnance supplies, as well as the paramount interest of the Army, so entirely dependent upon its subsidiary aid.

It is with no ordinary diffidence that I hazard my individual opinions in the presence of an assembly so capable to form sound judgment on a question fraught with such vital importance to the Army,—but sustained as such opinions are by the public utterances of soldiers of distinction and renown, I trust they may be received by you with kindly favour,—especially as I have no other object to serve than to further, as far as in me lies, what I believe to be the truest and best interests of Her Majesty's Service.

Transport is not only the great difficulty of—but to many its present condition appears to be an actual blot upon—our existing Army organization.

The necessity for having the "cadre" of an efficient Transport Service is universally admitted, nevertheless the duties connected with its organization, training, and development are assumed by one of the departments of the Army in direct opposition to the opinions expressed by our highest and most experienced military as well as administrative authorities.

This direct conflict between qualified opinion and existing organization engenders the belief that the present system is only a temporary one, whilst it is generally considered to be detrimental to efficiency and the mobility of the Army.

Before I proceed to offer for your consideration opinions regarding the system and principle by which I think a successful organization of Army Transport can alone be attained, I will ask you to permit me to pass in review the various phases through which that service has passed during recent years. And then, having touched upon the unsound and anomalous position into which it has lapsed, despite the opinions of our most able and distinguished commanders, I trust we

may be able to arrive at a clear definition of the principles and conditions under which this most important branch of the military service should be organized, alike in the interests of the Army at large, as well as of the public purse, which has in the past been so heavily mulcted through its defective organization.

In our war with Napoleon, the urgent demand for soldiers rendered it impossible for us to employ Englishmen except as combatants, our presence in Spain being, moreover, with a view to free that friendly country from invasion, we naturally counted upon the sympathies of the nation, whose military power had been broken, being bound up in our success, and we therefore depended on the transport and the resources of the country being held at our disposal.

Upon the Commissariat, as the Financial Department of the Army in those days, together with the purchase of supplies, devolved also the contracts and hire of the local transport required by the Army.

The inefficiency, uncertainty, and the absence of all organization and discipline evinced by this Commissariat Transport eventually forced his Grace the Duke of Wellington to raise a Military Transport Corps, called the "Royal Wagon Train," the duties of which we are informed by General Sir John Burgoyne, G.C.B., were "the con-" veyance of sick and wounded, ammunition, regimental baggage, and " everything brought within the range of the enemy's fire."

At the same time, Napoleon, finding, as he records in a decree of March, 1807, that "Military Transport is as necessary to me as " Artillery Train," also raised a similar service in order to obviate a dependence upon Commissariat contract which had universally failed him.

The Peninsular War having terminated, the "Royal Wagon Train" was disbanded, and in the long peace which ensued, the necessities which had called it into existence, and the services it had rendered, were alike forgotten.

In 1854, after long years of undisturbed tranquillity, during which the profession of arms had fallen into national disregard or decay, and military science had become moribund or dead, we awoke to find ourselves at war with Russia, without our having once recurred to the lessons of the past, or even cast a thought on the means by which alone our troops could be maintained in health and vigour in the field.

Transport had been lost sight of, no regulation recognized its necessity, nor who should be responsible for its provision. The Commissariat, as the purse-bearers and providers of the Army, claimed its control and direction as their special prerogative, for they maintained that not only did they raise the funds for its payment, but they also were its principal employers; and, further, that while combatants were all actively engaged at the front, they, with the supplies, were for the most part at the rear.

Settled down in a standing camp before Sevastopol, some seven miles from our base of operations, the self-imposed duty of conveying food and munitions to the front, sick and wounded to the rear, might, when accompanied by foresight, average knowledge, and skilful supervision, be considered as unattended with any insurmountable difficulty.

The Commissariat Service, however, being limited in numbers, unaccustomed to such duties, ignorant of the measures which should be enforced to maintain obedience and order, and insure the necessary care and protection of the animals—the requisite supervision being, moreover, laborious and altogether foreign to the sedentary duties of a clerical department—the general charge and the conduct of the convoys were permitted to lapse into the hands of vagabond overseers, who sold the food and so ill-treated the animals that they rapidly perished.

General Sir John Burgoyne, G.C.B., referring to this stage of Army Transport, writes:—

"Animals and drivers, on which our very existence depends, ill-
"managed, ill-used, and driven rapidly to inefficiency. It is the
"deplorable state of our means of transport that induces me to com-
"mence this paper. We have a very good force of wagons, bullocks,
"camels, horses, and mules, that have been almost entirely annihi-
"lated, and more by neglect and want of arrangement, that would
"secure their being properly fed and taken care of, than other causes.
"All went to pieces from want of organization and system. At every
"turn you meet them, abusing by word of mouth and blows poor
"beasts who are doing their utmost with loads ill-arranged and
"saddles cutting their backs to pieces. I am only surprised that those
"who have the superior charge allow such conduct without rebuke.
"I hope we shall turn to good account the present popular outcry on
"the state of the Commissariat and Army Transport."

Such was "Commissariat Transport" in 1854–55, unfettered by military method and supervision.

The sufferings and national risk which neglect and mismanagement had entailed, reflected discredit on Home Administration, and filled the public mind with apprehension; then, when all but too late, strenuous efforts were set on foot to rectify the error. A military Director-General with unrestricted power over money and means, aided by a few military Officers, was appointed to organize, and, as far as possible, "lick into shape," a heterogeneous rabble, recruited in the purlieus of our cities, while muleteers and drivers, ignorant alike of the British tongue and European requirements, arrived from every quarter. Mules from Spain, Italy, and Asia Minor, bullocks from Egypt, camels from Diarbekir, poured in without stint and regardless of cost; while vehicles of every class and character that the world could produce, or ingenuity devise, were landed at Balaclava.

Such was the "Land Transport Corps" of the Crimea.

The conclusion to which this phase of "Army Transport" brings me is, that it is a delusive notion to imagine a Transport Service, in any way equal to the requirements of war, can be extemporized at the base of operations, or leavened into an efficient and organized system by a department whose numbers in the field are never equal to the performance of their own normal duties, who have no reserve to fall back upon for assistance in their own extremity, who are individually without a practical knowledge of the routine necessary to such a service, and who are unable to supply that reliable commanding element which

is essential to establish and maintain discipline, and thereby secure successful results; who are, besides, specially, if not entirely, bound up in the transcendant success of one department—their own; who no longer possess the power to raise funds at will, but are dependent upon military approval for the expenditure they would incur; that it is not by a haphazard acceptance of volunteers the Army is to obtain Officers qualified to organize, instruct, and direct the discordant throng—ignorant alike of their duties, as impatient of control—who will ever find their way into the ranks of the Transport upon its sudden and extensive expansion incident to the exigencies of war.

On the return of the Army to England, the Land Transport Corps was disbanded, the Officers for the most part were relegated to their regiments, and the men were discharged.

In 1857, the "Military Train" was organized, and the opportunity presented itself wherein to benefit by past experience in the selection of Officers for the new corps. The Minister for War, however, considered that the opportunity should not be lost for the general reduction of the half-pay list of the Army, whereupon Officers from every branch of the Service were appointed; and it was not without difficulty that an infantry Officer who had lost his leg in action avoided joining this mounted corps.

A few months, however, produced a rapid and important change, as Officers availed themselves of opportunities to exchange to more congenial service, or retired from duties they did not care to acquire; a desire also evidenced itself to emulate the Royal Artillery in the condition of their horses and equipment. Had it then been possible to interpose obstacles in the way of exchanges, nothing was left to be desired for the future, save some practical regulations for the guidance of the corps in the conduct of its own duties, and its direct relation to the departments of supply.

In 1857, the 2nd Battalion of the Military Train embarked for service in China, but *en route* was diverted to Bengal, where, in the sudden pressure which required every available Briton to step forward and maintain the national honour, they performed distinguished service as light cavalry.

In 1859, at the instigation of the Commissariat, who had never ceased to cavil at army transport having received a military organization, a Committee, on which the War Office, the Army, the Transport, and the Commissariat were each ably represented, was assembled under the presidency of General Lord Airey, G.C.B., in order "to "report upon the provision and management of army transport in "the field."

On the 27th June, the Committee recorded as their opinion:—

"1st. That the Military Train should remain organized as at "present, and *not* be amalgamated with the Commissariat.

"2nd. In war time, it should be expanded sufficiently to provide "transport for the sick and for warlike stores, and the supplies imme-"diately acccompanying an army.

"3rd. Keeping this in view, a proportionate amount of military "transport should be attached to each department of the Army, such

"department having entire disposal and direction of the transport "attached, except in matters of discipline.

"4th. The transport which may be required, over and above the "military transport, should be obtained by the Commissariat at its "discretion, by which means the department would possess full "powers for providing conveyance for its supplies, and would be "properly chargeable with the undivided responsibility for doing so.

The Committee further observed, that:—"They do not think it "desirable, or possible, to amalgamate this corps with the existing "organization of the Commissariat Service, so as to place the Com-"missary-General-in-Chief at the head of it, or to make him responsi-"ble for its efficiency.

"It is true, that the Commissariat requires a very large proportion "of the transport of the Army in war time, but the other departments "of the Service require transport too, and there is nothing in the "special duties of the Commissariat to give it any peculiar claims "to, or qualifications for, the organization and management of a corps "of military drivers."

To these definite opinions but one dissentient voice, that of the Commissary-General-in-Chief, was recorded, and all doubts regarding the organization and the relative position which the transport was thenceforward destined to hold in respect to the departments generally, and the Commissariat in particular, appeared to be finally determined and set at rest.

At the close of the year, a battalion of Military Train embarked for China; the difficulties and friction which therefrom arose eventually became the chief lever which the Commissariat brought to bear before a subsequent War Office Committee in their unceasing endeavours to remove army transport from military authority, and subject it instead to departmental control.

As a military service the "Military Train" was directly under the Field-Marshal Commanding-in-Chief, receiving its orders through its Colonel Commandant, while its local duties were detailed by the Quartermaster-General's Department.

Upon arrival at Hong Kong, without any intimation through its Colonel Commandant that its duties and obligations to the Army, as practised at the camps of instruction at home, were to be cancelled on active service, the Military Train was at once made subordinate to the local Commissary-General, in accordance with instructions written at the War Office, by the Commissary-General-in-Chief, who thus was able to defeat the conclusions arrived at by the Committee, set aside the views of the War Department itself in the person of its representative, Mr. Godley, the Assistant Under-Secretary of State for War, who had said, "The present arrangement by which the service "of transport for the army in the field is made a separate branch is "based on sound principles," and in fact give practical effect to his own sole and dissentient opinion.

He thus addressed his subordinate at Hong Kong:—"It has been "arranged that the formation and management of all land and inland "water transport for the force in China shall devolve upon the Com-

" missariat, and that a battalion of the Military Train, consisting of " 289 of all ranks, shall be sent out and attached to the Commissariat " as an integral part of the Transport Establishment, with simply this " exception, that the internal economy of the battalion will be left to " its own Officers."

Thereupon a Field Officer in the Army was made directly subordinate to a Departmental Officer holding the relative rank of a Captain, who had been placed in "special charge of the transport" by the Commissary-General—one who, in a marked degree, represented the departmental jealousy and bias against the military organization which Crimean incompetence had brought about.

The command of the transport thus vested in the Commissariat—with them rested the principle upon which its expansion from a peace to a war footing was to be carried out. A company consisted of 2 Officers and 84 of all ranks of the class which indiscriminate enlistment twenty years ago brought into the ranks; it was now distended to 979 men with 1,356 animals, by the addition of Calcutta bazaar coolies, Manilla sailors and such riff-raff as would accept service. These, made up by natives of South China, where the horse is a beast almost unknown and dreaded accordingly, not only pushed the elasticity of the transport nucleus to an extreme, but engendered a feeling of irritation and soreness between two services which should have worked with cordiality together for the public good.

Fortunately, the able and successful organization of a Chinese Coolie Corps, raised by a military Officer, covered all other shortcomings.

In 1860, Sir James Graham's Committee, composed of the most eminent statesmen, soldiers, and administrators of the time,[1] assembled to inquire into "Army Organization."

They closed their proceedings after a most exhaustive inquiry into every question affecting the efficiency of the Army, leaving on record the absolute necessity for maintaining "Army Transport" as a service apart from all others under a responsible head, while the appointment of a Staff Officer possessed of high military rank was considered necessary in order to supervise the departments of the Army.

The Military Train was next employed in Canada in 1862, New Zealand in 1863, the Colonel Commandant and Staff preceding it to North America, where a memorandum, promptly issued by the Chief of the Staff (the late Major-General Sir Edward Wetherall, K.C.B), defined the duties of the Commissariat and Transport Services, both in regard to the Army generally, as in their relations to each other. The battalion embarking for New Zealand being provided with special instructions from the Field-Marshal Commanding-in-Chief, precluded the possibility of the transport being again extinguished as a military service.

[1] Viscount Palmerston, Lord John Russell, Lord Hotham, Sir James Graham, The Judge Advocate-General, Mr. Ellice, Mr. Sidney Herbert, Mr. Walpole, Mr. Horsman, Sir John Ramsden, General Sir William Codrington, Mr. Monsell, Colonel Wilson Patten, the Earl of March, Captain Vivian, General Sir De Lacy Evans, Colonel Lindsay, Mr. Mowbray.

In 1867, the Colonel Commandant, with a small staff, accompanied by a few Commissariat Officers, appointed to act as accountants and generally in a financial capacity, proceeded to Egypt and Asia Minor, in order to superintend and regulate the purchase and transmission of animals to Abyssinia.[1] Shortly after leaving port, it was announced by some of the Commissariat that upon their arriving at their destination on the coast of Syria, they would exercise that supreme authority over the general duties of the expedition which they considered their superior relative rank entitled them to assume.

With an Officer less prompt and clear-sighted than Colonel Clark Kennedy, C.B., these intentions might have been left to smoulder until they jeopardized not only good feeling, but even success. At once assembling all the Officers, he pointed out to each their respective duties, and intimated that unless such unwarrantable pretensions were forthwith abandoned, those persisting therein should land at Malta and return to England.

In this Officer's subsequent illness and death in Egypt, the Service sustained a loss it is not possible to over-estimate, especially in that struggle for power (growing out of the pretensions advanced in evidence before Lord Strathnairn's Committee) which was about to make itself felt throughout the Service. For his great experience and intelligence, firm yet conciliatory manner, would always have commanded attention and prevented the extinction of army transport as an organized military service, in direct opposition to the recorded opinion of that Committee of which he was a member.

The undeclared object which gave stimulus and mainspring to that Committee, as well as shaped the results deduced therefrom, may be thus succinctly stated.

Opinions had for some time been freely expressed that the duties performed by Commissariat Officers during peace afforded them but the smallest possible training or guidance for the conduct of those they would be called upon to discharge during active operations in the field. Furthermore, with the removal from the colonies of the bulk of our military forces, disappeared the necessity for maintaining therein a numerous Commissariat Service, while, in the United Kingdom, supplies were obtained by contract with equal facility, and at less cost than would be the case through the intervention of a semi-military department in their purchase.

The Commissariat Department, thereupon, felt itself threatened with extensive reductions, which were looked upon as the annihilation of their importance and hopes for the future. The aim of its most able administrators, therefore, became to raise an opportunity for demonstrating, not only its necessity to the State, which was universally admitted, but also its latent ability to conduct duties over a far wider range than that prescribed by its departmental regulations, in order, not only to maintain its influence and numerical importance, but also,

[1] The transport animals employed in Abyssinia consisted of—elephants, 45; camels, 7,417; pack mules, 12,920; pack bullocks, 5,894; draught bullocks, 1,139; donkeys, 827. Total, 28,242.

if possible, to advance its power and enlarge the sphere of its authority.

"Army Transport," being considered debateable ground, was fixed upon as the *cheval de bataille*, and a Committee was obtained to reopen and discuss the question.

The Committee, of which Field-Marshal Lord Strathnairn, G.C.B., was the President, was next induced, through various ingenious pretexts, to press upon the consideration of the convening authority the advantages which would accrue in the conduct of the public service through giving a more extended scope for their pungent inquiries. This having been conceded, the motive power, according as it appeared possible, sedulously endeavoured to bring under corporate control services and departments which had not one single duty in common, and which were not in any way directly interested in the question they had been originally assembled to discuss, whose duties, indeed, were eminently pacific, and in no way exposed to the tension and pressure of duty in the field; so that almost every executive, as well as administrative service, from the Purveyors to the Barrack Department, the Royal Engineer Train to the Quartermaster-General, appeared threatened with absorption in turn.

No greater evil can befall army organization or administration than over-centralization. The workman in many trades is, proverbially, never a master in any.

A vast amount of evidence having been accumulated regarding the principle and basis upon which transport organization should be effected, the following extracts are given from among those which had most weight with the Committee, and upon which they framed their report:—

Field-Marshal Lord Strathnairn, G.C.B., maintained that:—"The "idea of organizing a train, of which all the elements would not be "under military discipline, is a fatal illusion."

General Sir Charles Napier, G.C.B., had long before laid it down as imperative that:—"Transport should be on a military basis."

Sir Henry Gordon, K.C.B., Commissary-General of Ordnance and Stores, affirmed that:—"Under whatever Officer the transport of the "Army may be, it is essential that he belong to no department."

Lieutenant-General Sir Henry Storks, G.C.B., stated that:—"I "think it (the Transport) should have a regimental organization, and "be under military subordination; it ought to be entirely of a military "character; for the efficiency and discipline of the corps, it ought to "be under military control and organization." Furthermore, "he "agreed" with the principles stated in the Committee's previous report, as enunciated by Sir William Tyrone Power, K.C.B., Commissary-General-in-Chief, that:—"The corps should be military, but "with the power of command limited to subordinates of the corps, and "be composed of Officers who have had at least two years' service in "the Army." Sir Henry Storks concluded by saying, "I would give "the Officers military rank. I would make them a corps apart."

The personal convictions of the future Controller-in-Chief therefrom appear both distinct and clear. Sir Charles Trevelyan, K.C.B.,

informed the Committee:—"Transport must be organized on a mili-
"tary principle without any admission of purchase and exchange.
"When you have to deal with transport as relating to all the depart-
"ments of the Army you could not attach it to the Commissariat as a
"department apart from the others."

Commissary-General Scott Robertson, C.B., stated:—"There should
"be a separate and distinct department for the Army, charged with
"providing all transport required by the Army, both in peace and
"war."

Commissary-General de Fonblanque, an Officer who had written extensively and ably on Army administration, gave as his conviction that:—"All transport should be placed under an Officer who would "be above suspicion of favouring one department at the expense of "another." "A Commissary-General might be suspected of wishing "to favour his own department."

In reference to all of which, Lieutenant-General Sir Edward Lugard, G.C.B., informs the Secretary to the Treasury:—"The evidence before "Lord Strathnairn's Committee was given by witnesses of great "ability, competence, and distinction; and Sir John Pakington is of "opinion that few men could read it impartially without admitting it "to be conclusive."

The Committee, guided by such opinions, emanating from Officers of such undoubted experience and independent judgment, while they recommended the amalgamation of the departments of Supply, were of the unanimous opinion that:—"The organization of the train "should be military. Great care should be taken in the selection of "Officers for a service to which such important trusts will be confided, "and for which intelligence, energy, and self-command are required. "Appointments of military Officers to the train should, as in the rest "of the Army, be made on the recommendation of the Commander-"in-Chief. In their military character, no distinction would be made "between them and the corps of the Army, except as regards the "limitation of the power of command."

How far these approved recommendations were carried out, or thrown to the winds, outflanked by departmental influence, the sequel will show. But in the meantime, the Treasury demurred to the projected expenditure, so that the introduction of the new system became doubtful.

The Commissariat, with whom had originated the proposed scheme, at once resorted to various expedients to qualify, if not avert, the threatened catastrophe.

At the instance of the Commissary-General-in-Chief, promotions in the Military Train were at once suspended, while in the Commissariat they were maintained with as much, or more, activity than ever.

Finally, the most approved method for overcoming the difficulty which had so unexpectedly declared itself, appeared to be to lump the *personnel*, as well as the cost, of all the services concerned, Transport included, then by whittling down those undefended, not only promotion, but high position, would in the main fall to Commissariat Officers, the necessary result of the superior relative rank which they excep-

tionally at that time enjoyed; and on the whole a saving over current expenditure would appear (at all events on paper) as the result!

The financial Authorities rose to the bait, and Control was triumphant along the line.

The Controller-in-Chief, believing rather in expediency than imbued with any fixed principles of administrative reform, had already given way before the pressure, thrown over the deliberate opinions of the Committee he had been appointed to carry out, recanted the convictions he had so confidently asserted before it, and, as no power existed which could interpose to prevent the transport being emasculated by the removal of its military element, it forthwith became the *spolia opima* of the Control Department.

Commissariat Officers had commenced their career with the high relative rank of Captains, which had been conceded to them in 1858, in consideration of the stated magnitude and importance of their financial dealings, of which Control now almost altogether relieved them. Military Train Officers, on the other hand, had seen long service as subalterns, and in some instances had been deprived of their legitimate promotion through the one-sided action of the Commissary-General-in-Chief. Thus it came about that, on a Commissariat Officer joining the Transport, with his high relative rank and four years of departmental service, he at once became the superior Officer of those who had fifteen years' experience as Transport Officers and the knowledge acquired on two or three campaigns.

Thus had army transport become subservient to other interests than those which had been deemed essential to secure its efficiency.

In 1874, the Ashanti War and autumn manœuvres, having demonstrated the inability of the existing system to satisfy the requirements of the Army, and those of departments other than the Commissariat, another Committee under the presidency of Lord Eustace Cecil, Surveyor-General of the Ordnance, assembled, to consider the question of "Transport Organization."

The Committee reported that the Transport ought to be a service distinct from Control, but it was desirable to retain a connection with the united Supply services. The report was printed, but was tripped up before being acted upon.

Next, Control, having over-inflated itself, collapsed, munitions and stores returned to their original and independent position, and finance, the palladium of the Commissariat, decamped, never to return.

The Commissariat is now on a par with all other departmental services. It vindicates the propriety of its demands before military authority; it draws its funds from an independent department, and it justifies their expenditure before independent audit. It nevertheless still retains army transport in its grasp, although we have not lost sight of the opinion expressed by Lord Airey's Committee that "the "other departments of the Service require transport too, and there is "nothing in the special duties of the Commissariat to give it any "peculiar claims to, or qualifications for, the organization and manage-"ment of a corps of military drivers."

We now turn to the recent South African campaign, which

affords an opportunity by which to test the results of the skill and knowledge acquired during ten years of uninterrupted Commissariat experiment in the organization and training of "Army Transport" for service in the field.[1]

A brief study of the "Reports on Transport in the Zulu War" will convince the most sceptical that they were, for the greater part, written by Officers who had been educating themselves on a subject which for the first time had required their attention to its practical details.

We learn from these reports that throughout the war the losses in animals were "enormous," and so long as transport duties are adopted by Officers as a mere temporary expedient, or as an alternative with others of an essentially opposite nature, and are not chosen as a permanent professional employment, so long, under the varying conditions of country and climate, demands, and resources, will the losses to the State be equally "enormous" in every war in which we engage.

We are told of "the great absence of efficient and capable Officers "with the transport of the division, only one of those employed having "any experience." We hear that "in many cases the Officers in "charge of sections had no previous knowledge of transport work, "and consequently the mules did not receive fair treatment."

Deputy Commissary-General Morris, C.B., informs us:—

"The ox is the most useful and most economical animal for military "draught transport."

Unfortunately he has to add:—

"As a rule, little consideration is shown for the ox, and the conse-"quence has been a high percentage of loss." He then tells us, "Purchased transport is not to be recommended." And as regards "hiring," "the result is, that the owner cares but little whether the "oxen die or not; the losses are enormous in consequence."

The notable absence of practical knowledge which these reports convey, together with the waste of animal life which ensued therefrom, call vividly to memory like causes and effects in long past Crimean days, when General Sir John Burgoyne, G.C.B., passed his withering censure on the Commissariat maladministration of army transport.

Such a condition of Transport Administration was in a large measure indubitably due to the depletion of the trained military element it had suffered since its absorption by a purely clerical department, unhinged, too, as it was by the unceasing ebb and flow through its ranks of young, undisciplined, and inexperienced Commissariat Officers, and the consequent want of knowledge which prevailed, especially in regard to the means and method which should have been adopted to keep under control, to guide and restrain, that "inferior class of drivers," which these reports tell us had been supplied—drivers who are described as "a lazy, drunken set of lying, pilfering rascals, always flogging his

[1] The transport, hired or purchased, numbered 32,000 animals, the greater proportion being oxen, at an average cost of 14*l.* each, 30 per cent. of which became non-effective during three months' service. The price of mules averaged 29*l.* 5*s.*, about 700 of which were imported from New York and Monte Video, while horses cost about 22*l.* 1*s.*

"mules into a trot;" whereas, "if let alone, he will walk out four "miles an hour."

To manage natives of different races, collected for one common object, is a task for Officers skilled in dealing with men of various passions, tempers, superstitions, and fears. Such a knowledge can never be acquired through the routine of the counting-house nor the collection, and storing and distribution, of inanimate material.

Again, in Afghanistan, where transport was administered on a system nearly allied to our own, we hear of a similar costly and wasteful expenditure of animal life, having its origin from similar causes—a Transport Service, unskilful, because not permanently officered—a Commissariat in every way capable of performing its own immediate professional duties of supply, but so engrossed with the magnitude and importance of its own departmental concerns, that transport became an object of secondary consideration, its supervision and working, therefore, readily consigned to Line Officers who were glad to get to the front on any terms, but who had yet to acquire experience and a practical knowledge of the service they had undertaken to conduct. The consequence is stated to have been that 40,000 camels were expended, and out of 11,000 animals at Sibi, some 5,000 were inefficient, chiefly from sore backs, due to the want of skill or attention in the fitting of the pack-saddles, and loading the animals.

The result to the Service was, that the mobility of the Army was suspended, if not destroyed!

At no period in the history of our Transport Service has a more faulty essay at organization been attempted than that now prevailing. Its Officers are simply birds of passage through its ranks; they hybernate for a season under its shadow, then pass on to more temperate climes and occupations, having gained that little knowledge whose dangerous acquisition we are proverbially warned to avoid.

The "two years' service in the Army" prior to joining, so emphatically insisted upon by Lord Strathnairn's Committee, have of necessity long since been dispensed with, as Line Officers would not come forward for the interchangeable duties expected from them. A somewhat similar length of service in the junior rank of the Commissariat has now been substituted, as affording all the requisite knowledge for a position of command.

Each company now possesses a Captain, with a Quartermaster to do the duty of and act as a subaltern! one in whom ambition should be dead, as his position and prospects give him nothing to hope for in the future! The average strength of a company is 125 of all ranks and 63 horses, with their harness and carriages, skilled tradesmen and materials for the repair of its costly and perishable equipment.

Furthermore, Transport and Supply Executive are now amalgamated into one "unit," the company, Army Service Corps, notwithstanding that the Supply men, when on field service, would of necessity be employed either at the base of operations or the various depôts along the lines of communication; whereas, on the other hand, the transport would be exclusively engaged in passing to and fro or serving with the troops in the presence of the enemy.

There is also a remarkable absence of any uniform system in posting these Supply men. A company may at one time contain drivers and butchers, bakers and blacksmiths, clerks and wheelwrights, storemen and farriers, issuers and saddlers, labourers and orderlies; or it may have all bakers to-day, clerks and butchers next week. When a company marches to a new station, the "Supply" men at once disappear, go elsewhere, while the company Officers, if they be not either one or both removed, distracted by the confusion which reigns around them, can neither attend to the necessary details, nor devote their minds to the responsibilities attendant upon the departure of their men, horses, and equipment.

To an organization such as this we are trusting for our maintenance and success in the field.

In the Crimea, the Commissariat employed in its exclusive service, 137 Officers, 3,894 subordinates, while the Transport mustered, in that country and at its depôts, some 200 Officers, 21,000 drivers and 28,000 animals.

At the present time, the Commissariat, Transport, and Barrack Services combined consist of only 197 Officers, 37 of whom are, from some occult reason, designated Quartermasters, and relegated to what is termed a "subordinate section," whereas the title of Quartermaster is equally, if not more correctly, applicable to Officers belonging to the "superior section" while holding a responsible "charge;" indeed, so allied are the duties of Commissariat Officers with those of Quartermaster that it has been proposed, by Officers high in the department, to substitute a Commissariat Officer with each regiment of the line, in place of the Quartermaster belonging thereto.

The possible requirements of the Commissariat and Transport Services respectively being so extensive in time of war, while the existing establishment is evidently so numerically unequal to meet them, unaided, it becomes a matter for grave consideration how, in the interests of the Army and the public, transport duties are to be conducted, under the existing system, with any hopeful prospect of success.

The transport maintained in peace being only a groundwork for its extension in war, the method on which its expansion should be conducted deserves attention.

In the French "Equipage Militaire" each company has, on its peace establishment, twice as many Officers and non-commissioned officers as active service requires, so that, on a declaration of war, half of their number may be removed to organize and train a second company, which acts as a depôt to that in the field.

The more practical course, however, appears to me would be to keep the "unit" of the service at such a moderate strength that, by promoting non-commissioned officers a step in rank, at least twice as many men and horses could be added without impairing efficiency or injuring that methodical system which can alone render transport reliable on the influx of a number of men without discipline or practical knowledge.

Heretofore, the Commissariat have invariably found it necessary to

appeal to the line for help, the Officers of which will go anywhere or accept any honourable duty to see service, yet, when attached to transport, they do not receive with equanimity the ever-varying, crude instructions given them regarding "my transport" which the frequent change of Commanding Officers, belonging to a semi-civil department, provides them at each successive halting-place. Hence, feelings of irritation arise; harmonious action is jeopardized; indifference possibly engendered; at best, a cheerless obedience obtains where cheerfulness and a readiness of individual resource should be fostered as alone able to combat the ever-arising difficulties attendant upon dealings with ignorant drivers, sick and lame animals, breaks-down, delays in deep ground, freshets on fords, and all the attendant worries of such a service.

For a country like England, whose interests extend over every quarter of the globe, and whose "raj" embraces kindred and nations dwelling under the most opposite conditions of life and its physical surroundings, it would be impracticable to maintain during peace a Transport Service in any way equal to the emergencies which war might demand; it is nevertheless essential to possess a small but model force as a training school from which to disseminate a knowledge of the more extended and practical duties of active life. Such a result can only be assured by employing as Officers and instructors those who have made transport their study and who are proficient in the knowledge of its application and special requirements in war.

Hitherto, the practical utility of the transport "nucleus" we possess has been sacrificed to a desire to make it, as far as possible, "pay for "its keep"! an object which should never be a preponderating factor in the employment of corps or departments of the Army. Transport should not be idle, but the notion that it is practical economy to put $2\frac{1}{2}$ and even 3 tons weight behind a pair of horses, one of which carries 17 stone upon his back, the other 10 stone 8 lbs., is really not worthy of discussion.

Upon landing in an enemy's country, an Army would be powerless to advance unless possessed of the means by which to ensure the requisite supplies of munitions and food being conveyed, without the possibility of failure.

To rely upon being able to secure local transport within some marches of the point whereon a descent on an enemy's coast is to be made would be a hazardous experiment, and even should the base of our operations be within the territory of an ally, it is doubtful that any transport could be spared for our requirements, while the employment of natives of the soil in direct communication with our troops would render impossible that secrecy and certainty of movement essential to success. Such can only be attained by our possessing an organized transport under military discipline, ready to land and advance with the troops, to be supplemented by the gradual formation of a well-ordered auxiliary service in its rear.

The advantage gained by the employment of a "military" rather than an auxiliary transport is thus defined by the late Major-General Sir Edward Wetherall, K.C.B.:—"A military transport renders

" troops more mobile than an auxiliary transport, as a column so " supported can move with promptitude and secrecy; whereas, if it " depended on hired transport, time is lost in collecting it and in- " formation is given of your intentions."

It appears to me to appeal both to reason, as well as to common sense, that a Commissariat Service should be limited to *provide!* while a Transport Corps should be required to *convey!* and that neither service should claim to undertake responsibilities beyond those which authoritative decision confides to them for execution.

The higher qualities which render a Commissariat Officer conspicuous for his ability and skill are the tact and judgment he may display in his dealings with shrewd grasping contractors, and the foresight he exhibits in obtaining and collecting abundant supplies, at reasonable cost, in a country hostile or indifferent to our arms.

The Right Honourable Sir John McNiell, K.C.B., who was deputed to proceed to the Crimea, and probe the causes of our misfortunes there, thus expressed his views before Sir James Graham's Committee:—" I think that a Commissary-General, in supplying an army, " has enough to do, and that his undivided attention ought to be " directed to that object."

Such a duty is at all times arduous and intensely responsible, yet it is not the outcome of an abstruse science. A Commissariat Officer must possess the unassailable integrity of a British gentleman, have a clear knowledge of the fundamental rules which govern the conduct of his special service, and the allegiance which, as a member of an administrative department, he owes to the combatant forces, and that while he yields an unhesitating obedience to the canons of his written law, he never forgets, notwithstanding the success and accumulated confidence derivable from the past, that the principles which govern the exercise of his duties have not been removed beyond the reach of ordinary common sense.

On the other hand, it will commend itself to reflecting and practical minds that organized transport should be under direct military command, for its efficiency is altogether dependent upon a thorough knowledge of men and animals, and individual skill in dealing therewith. Military system and regularity are essential in order to attain that united action by which alone the unfailing and prompt transmission of supplies, over long lines of communication, can be assured to the troops, while skill can only be acquired through permanent constant employment in its duties.

The development of transport specially raised for active service cannot be forecast by any predetermined principles for its guidance; its organization must vary according as attendant, and possibly exceptional, circumstances demand. It is, therefore, the more necessary that an Officer of experience in the Army and the Transport, possessed of judgment and discretion, should be made its recognized head, and be placed in direct subordination to the Commander-in-Chief in order that from his foreknowledge he should not only be able to advise, and under authority, take the means to provide the possibly extensive and growing requirements in men, horses, and equipment which the special

service might require, but also from his position, experience, and personal responsibility have power to check all approach to a wasteful expenditure—a responsibility by no means inferior to that which is entailed in the provision of the food or stores which the transport under his orders is required to convey.

In this responsibility is involved the engagement of drivers and their headmen or conductors, as well as the pay, rations, possibly clothing, to be given to each. The purchase of animals according as the campaign may require, and all the collateral services necessary to keep them in health and efficiency, &c.

Organized Transport.

Organized transport may be divided into "Military" and "Auxiliary." The former composed of enlisted soldiers in numbers proportionate to that of the troops in the field. The latter, a foreign element, its numbers in proportion to the animals purchased, and dependent upon the distance over which supplies will have to be conveyed.

Military Transport.

On the organized military transport should devolve the duty of conveying supplies from the expense depôts immediately in rear of the Army to the troops engaged, of accompanying foraging parties, flying columns, and all such services as might possibly bring transport into collision with the enemy.

The selection of Officers for transport service is one of the most important points connected with its organization. They should be volunteers from the Army, desirous of making its duties their permanent professional employment; and in consideration of its more arduous character, their inferior prospects of distinction, and the loss of many advantages which in their previous service they had enjoyed, they should receive a higher rate of pay than the line, as an equivalent and inducement to serve.

No service requires such careful training, as no other is so dependent upon its own resources, or so frequently scattered, and thereby removed from direct control; discipline alone can give it that cohesion and unity of purpose necessary for the punctual execution of orders, due submission to superiors, and the systematic performance of its daily routine of duties, while the powers of the Mutiny Act can only be with safety entrusted to Officers acquainted with and continuously engaged in its details and their practical application.

A serious hindrance to the efficiency of transport in the field is the absence of a simple code of instructions for its management, which would be accessible to the Army generally, and which would place a knowledge of the conduct and requirements of this service within the reach of all Officers desirous of acquiring an insight therein. Some ten years ago an effort was made towards this end. The Field-Marshal Commanding-in-Chief accorded his approval, but departmental reluctance has hitherto prevented its promulgation.

Auxiliary Transport.

Auxiliary transport differs from "Military" inasmuch as its existence is due to a period of exceptional pressure; it gives its service for a stipulated wage, terminable by agreement, and is not in general armed in aid of its own protection.

Were it possible, it would no doubt be desirable that auxiliary transport should be British, for if composed of foreigners, or raised in the country wherein operations are being carried on, or even in a neighbouring State, its members might be ill-disposed, if not directly hostile to the cause which money and not devotion had tempted them to serve. To keep such a service in hand is at all times a matter of extreme difficulty, and requires Officers with patience and skill to direct and control it, while to defend and restrain it on the line of march will at all times tax our energies, if not add to our embarrassments.

The method of raising an auxiliary transport which appears least open to objection is to hire individuals from the country wherein animals are being purchased for field service.

Auxiliary transport should not be employed on any service likely to bring it into a collision with the enemy. It should be leavened and instructed by skilled Officers detached from the military branch, or who had qualified therein for its command.

Regimental Transport.

I cannot but think that regimental transport ought to be a subdivision of the organized army transport, as the number of men which the employment of combatant soldiers as transport would withdraw from the fighting line of the regiment, and its consequent diminution in aggressive power, renders it desirable to avoid taking the highly-trained soldier for duties which, under a proper organization, would be better performed by those whose instruction had been altogether confined to transport service. Besides, the probable re-absorption into the ranks of the regimental transport soldier as the older fighting element became non-effective, might have an injurious effect on the regiment itself, and be prejudicial to the public interests.

On a regiment disembarking for service, army transport should at once be attached thereto and be placed at the orders of the commanding Officer, thereby making it a matter of regimental responsibility that rations were obtained from the field magazine with due regularity and that camp equipment was up in time where wanted.

Regimental transport should be kept effective in men, horses, and equipment by the transport of the division, to which all non-effectives should be sent for treatment or repair. When practicable, regimental transport should picket with the brigade transport of the division, in order to ensure the due care of the animals and the efficiency of the equipment.

When not required for the special service of the regiment, the transport should take a fair share of the general duties.

Local or Hired Transport.

Local or hired transport should be exclusively a Commissariat departmental service. War is but seldom waged in a country destitute of resources, and when purchasing the produce of a country to fill its magazines and depôts, the Commissariat would as a matter of necessity, as well as economy, employ the available motive power which the country possessed.

Expediency suggests the propriety of an invading force abstaining as much as possible from impressing the local transport of the country, as should vehicles and animals be forced into our service, contractors and others who would largely supply our Commissariat wants might thereby be prevented from delivering their supplies, while the inhabitants would possibly become chary of trusting themselves or their cattle within the focus of our rule.

It is an indisputable fact that no country grows corn and breadstuffs, or raises cattle, beyond its own requirements without being possessed of the means necessary to convey such across its borders to a profitable market elsewhere. This local transport, with the produce it has been accustomed to convey, should as a matter of course be hired or contracted for by the Commissariat Service as the special and peculiar transport of that department.

Railways.

In considering local transport we ought not to overlook the important service which railways may render us on a campaign; nor, on the other hand, should we lose sight of the difficulties which might possibly be entailed on the administrative departments, owing to supplies having been forwarded for the immediate use of troops who, through their instrumentality, had been already removed to a distance from their predetermined positions.

The assistance which can be derived from railways passing through an unfriendly country is precarious in the extreme; a small matter will impede, if not destroy, the traffic, while its ministration can only be secured by constant vigilance and the employment of an armed force.

The conditions on which an army obtains the greatest assistance from a railway is when it marches parallel to it, or is stationed at one of its termini; even then railways are of all local transport the least to be depended upon, because affording so many opportunities to an enterprising enemy to destroy it or render its assistance a matter of uncertainty.

Constructive Park.

One of the material aids to the successful action of transport in the field would be the possession of an efficient constructive and repairing park at the base of operations.

Such an organization need not entail a large, nor possibly any, increase in the annual estimates during peace, while the saving therefrom in risk and money would be incalculable in time of war.

Fifty or a hundred Transport artificers, organized as a company, would work for at least as little as so many civilian mechanics. Such a company should be composed of a due proportion of all trades engaged in the construction of wheeled vehicles, the working of a steam saw-mill, the making of harness, pack-saddles, &c., so that on the outbreak of a colonial or continental war it might proceed to its destination, fully capable of undertaking all the requirements of the service, and of preparing for demands likely to be made upon it.

In their course of instruction, the artizans would acquire a knowledge of the principles upon which the construction of wheeled vehicles is based, so that not only could those of standard patterns be repaired, but possible improvements be made in the rude country vehicles suggested from their practical knowledge.

As an independent service, transport would have a history of its own and would bear in memory the vehicles the value of which had been proved under similar conditions, on previous campaigns, and the introduction of which might be attended with advantage.

Many efforts have been attempted to improve the pattern of our military wagons, to each and every one exceptions may justly be taken; their undue weight, their draught, the lowness of forewheel, &c. Nor, to my mind, has any yet been produced to compare on equal terms with the old Flanders wagon, and next to it in usefulness, the much despised "equirotal."

The vehicles specially suited to accompany flying columns, and to keep up with troops traversing defiles or passing through a mountainous and difficult country, are the "Maltese" and "Savoyard" carts, owing to their lightness, combined with strength, their ease of draught, and facility for repair, while they are remarkable for their cheapness and the rapidity with which they can be constructed.

Pack Equipment.

The use of the pack-saddle is the least understood of the various means which may be necessary for the conveyance of our supplies on active service.

The adjustment of the pack-saddle and the loading of the animal require considerable practical skill, the object being to make the burden ride by equipoise, its weight to be sustained by vertical and lateral pressure distributed over the whole surface of the animal directly affected by it. On starting, a slight cant in the saddle will at once declare the inequality of the weights at either side. No practised packer will be so far astray in his previous arrangements, that a little easing in the load will not restore the balance, or a stone from the roadside readjust the weights, without necessitating the delay of the convoy.

The mule is the best of all pack-animals, but bears a bad character in England, chiefly because he is not understood; he is a foreigner—impressionable, possibly, at the same time, vindictive—at least, we think so; he will, however, follow with blind devotion the being or animal he likes, and will go through great suffering rather than be

parted from the object of his choice. Abstemious in both his food and his drink, he thrives under a tropical sun and a northern snow.

The regulation pack-saddle weighs about one-fourth of the load (55 lbs.) an average animal can carry; it is both costly (6*l.* 14*s.*) and cumbrous, too much hampered with straps and buckles for indiscriminate use. Admirably adapted for large mules, it is not well suited to small animals, which are the best class for pack purposes. The great similarity of these saddles also constantly leads to their interchange between different sized animals, either through carelessness, or in the darkness and hurry of loading. This is a frequent source of sore backs and general inefficiency.

The best of the many pack-saddles I have met with, and used for ordinary work, I found in the Island of Cyprus, when purchasing mules for the Abyssinian Expedition. It cost about ten shillings; a man could make three in a day; it protected the animal from abrasion under his load, and was an excellent covering for him during the night. Among the very many hundred animals I inspected, a sore back or a wrung wither was an extreme rarity.

Arms.

A military transport should be armed to give it confidence, and to command respect.

To a driver with a pair of horses in hand, a sword is a useless encumbrance, beside, it is a weapon for personal encounter—the last notion to be inculcated in a Transport soldier; a revolver is a tricky, dangerous class of firearm, except in the hands of the most cool, unencumbered and skilful; in those of a driver, more perilous to his off horse than any other thing living.

The weapon for a Transport soldier, I venture to think, is a light carbine of a moderate range, with which, while on sentry over his equipment or his convoy, he will always command respect, beyond that which the length of his arm or the power of a sword will either reach or secure.

Conclusions.

I have now brought under your notice the army transport of the past, the present, and that which I think will best commend itself to your consideration as the most practical and reliable organization for the future, the leading principles of which may be briefly recounted in a few sentences:—

1st. In the interest of the Army and the State it is imperative that army transport be made a permanent military service, and at once removed from Commissariat want of knowledge and experience in its proper organization, discipline, and training.

2nd. That a military Officer, to be attached to the headquarters of the Army, should be charged with its organization and professional instruction during peace, its provision and development in war.

3rd. That Officers who would look upon "Army Transport" as a profession, and not as a temporary occupation, should be selected to command and discipline it.

4th. That army transport should not have any pretension to be considered "Cavalry" or "Commissariat," nor other than TRANSPORT.

5th. That opportunity should be given to Officers generally to attach themselves as a temporary measure to the Transport, in order to acquire a knowledge of the system to be adopted in treating horses and equipment, and thereby qualifying themselves for the command of auxiliary transport in the field.

6th. That army transport should comply with the demands made upon it by the Supply departments of the Army; it resting with them, if necessary, to justify their requisitions, on the same principle as they now justify their indents for cash or stores on the other departments of the Army.

On such a basis alone do I think that a reliable "nucleus" of "Army Transport" can be organized during peace, capable of systematic and efficient expansion in time of war. The colourable pretext for its junction with the Supply Services which at one time obtained has been dissipated through the disruption of Control, and is now further dispelled by the removal of the Commissariat from War Department supremacy, while the Ordnance Store continues subordinate thereto. So much the more necessary, then, is it, that "Army Transport" should at once and henceforward hold a position of neutrality, untrammelled by compulsory submission to the direct will of either of those departments, especially of one whose executive, as stated by one of themselves, ought to be "above suspicion of favouring any department at the expense of another," and especially of being even "suspected of wishing to favour his own department."

Military authority, which carries with it personal responsibility, has already affirmed on whose shoulders ought to rest the liability for the provision of the necessary supplies—on whose that of their subsequent conveyance and delivery. That Commissariat should claim the direct administration of two services so divergent in character and conduct has as little reason in it as were the Royal Engineers to insist that, as they are responsible for the trace on which they erect the batteries, so also should they fight the guns, the skilful unflinching service of which covers our Royal Artillery with renown.

I have endeavoured to show that the present transport organization, conducted in the self-interest of the Commissariat Department, is not calculated to meet the pressing, varying wants of the Army; nor is it to be relied on for the discharge of those duties and obligations to other departments which an independent and responsible transport service would be prompt to render. That it is, at best, little else than a conglomerate, which the first sharp tap of the hammer of war will disintegrate and leave us little else than a wreck of rubble behind!

Supply and Transport rolled into one very much resemble an ill-assorted Siamese twin, each an impediment to the natural and physical development of the other. To be of any service or use in their respective vocations and callings, the ligature which now binds them together should be severed. It is idle for one to cry out that he will be hurt by the process of separation, for the operation must

altogether depend upon the prospect of securing the greatest possible amount of good for the family to which they belong. This family is the British Army, whose interests are dearer to us than anything we can call our own.

Lord WAVENEY: I would ask to say a few words with regard to the interesting statement we have heard, and although I have no pretension to understand the handling of transport forces, still I can give one or two facts of history and some deductions from them. I remember something of the wagon train of which our gallant lecturer has spoken, and we have heard of the extraordinary efficiency of that wagon train as it was in the Peninsula. I believe the account to be perfectly accurate, that on the occasion of the Allies being at Paris, the Duke of Wellington was anxious to give them an idea of the battle of Salamanca, and Sir George Scovell's wagon train was placed as a skeleton force to represent the French troops. I, therefore, believe it will be found correct that the wagon train has existed for some considerably longer period than is usually supposed. I think I recollect also, this wagon train was utilized by the late Sir Francis Head, and if I remember right, on Banstead Downs the wagons were dragged by the lasso with the assistance of some horses from a cavalry regiment or riding school. As to the general principle, I take it, from what I have observed in the two largest Armies that have been put in the field for many generations, that is to say, the United States Federal Army and the German Army, there are two lessons we may derive from their practice. It cannot be very difficult to move a transport system which is always within reach of river or road, and when the country is thoroughly occupied by our troops. It is when you have to deal with rough surfaces, which are without roads and broken up in every direction, and have to organize corps, that the principle that has been adopted and has become so useful might perhaps not be satisfactorily worked out. With regard to the United States Army, I have studied the Quartermaster-General's Report at the breaking up of the great war. It is one of the most interesting and detailed Reports that I know, and comprises about 700 pages. He provides for every requirement that is not absolutely otherwise provided for, and he provides for Naval and Land Transport; and to show the accuracy with which the details are worked out, every mule, every horse, every fragment of transport power is counted up in decimals. There are tables which show how long wounded mules are likely to be absent from their depôts, and so on, and it is carried out with such accuracy that in stating the number of mules which had become the property of the Federal Army, there are three columns, one for mules purchased, one for mules captured, and one for mules of which the mode of acquisition is not detailed. Then, again, with regard to what we have heard as to the railway system being dangerous in consequence of the facilities it gives to an enterprising enemy, we find in the United States there were always what we should call "break-down gangs" ready on all the great lines of railway, and there was such careful preparation made that in the neighbourhood of large trestle bridges, or places where interruption would have been of serious consequence, there were always depôts of stores at such a distance that a raiding force could not destroy both the bridge and depôt at the same time, so that as soon as the evil was discovered it was obviated. It seems, then, that there must be some principle, which, if discovered, may be available under all circumstances, even under the disadvantageous circumstances of having to form your corps, your service, and your tools, and I take it, that principle lies in adaptation to the circumstances of the country; and here I will close with a remarkable statement that I remember many years ago hearing from the late Sir Robert Wilson. He was from 1812 to 1815 principally attached to the Russian and German Services, and he remarked that after the affair of Culm, when the Bohemian mountains were one mass of torrents of water, the Allies would have been in considerable difficulty in getting up their ammunition, in fact, their ordnance stores ran very short indeed, but, by the greatest good fortune, all the tumbrils of the Russian Service were two-wheeled; the two wheels would go where four wheels could not have gone, and it was owing to the advantages of the Russian equipment that the Allies were able to penetrate into Bohemia, and carry the campaign forward. I do not presume to indicate how our organization may be improved, in fact, we have learned so much

to-day, we shall have very little to learn in that matter; but with regard to these facts, especially those relating to the United States Army, I am inclined to think we may find a great deal of instruction from the work of that wonderful force that was composed of such very small and such unaccustomed materials.

Mr. de Fonblanque: It seems to me that the object of the lecturer is to re-establish the Military Train. Now, I have had a good deal of experience of that corps; I served with it during the war in China, and in other places at home and abroad, and I am bound to say wherever I have seen it tried, it has been a failure, and for the strongest of all reasons, that the men composing it were above their work. It was perfectly notorious that they assumed to be light cavalry instead of the carriers of the Army; and the consequence was their duty was inefficiently performed. The story goes, that in a ball-room a lady not knowing his uniform, asked a Military Train Officer what service he belonged to: he said, "We are the "Military Train." "What is that?" said she: "Well," he replied, "we are the "same as the Horse Artillery only without guns." The Officer commanding the corps in China himself told me, again and again, how much he regretted the existence of such a feeling; but it was there; and it was aggravated by the fact that Officers constantly entered the Military Train, not with the view of becoming Transport Officers, but with a view to promotion, exchange, or selling out. It was a purchase corps, and its Officers were continually shifted, and had not time to learn their work, even if they wished to do so. For this reason, among others, the Military Train utterly failed to answer its purpose, and it was abolished by universal assent. When we come to the practical part of Colonel Shervinton's scheme, as to the organization of a future Transport Corps, I agree with him in many of his details, but in the matter of control I cannot make out how the thing is to work. Let us take the present war in South Africa: when the Auxiliary Transport is the main transport, the regular organized Transport is very small in comparison to the Auxiliary. The lecturer attaches great importance to the maintenance of military discipline in the regular Transport, but surely it is quite as necessary that there should be discipline in the Auxiliary Transport; but that he is quite willing to leave to the incompetent Supply Officers of the Army. Then, again, Colonel Shervinton entirely repudiates the principle which I thought that all experienced Officers, both military and departmental, have acknowledged to be quite unassailable, namely, that you cannot separate Transport from Supply. It is impossible for a General to hold me responsible for providing for the Army under his command, while I am at the mercy of another Department for the means of collecting and distributing the supplies. I may have my stores ready, and yet, as very frequently happened with the Military Train, the wagons are not there to convey them when wanted, and the supply thus fails. Another weak point in the proposed Military Transport relates to its control. Colonel Shervinton says that all Departments should make their requisitions on their own responsibility; but surely somebody must have to decide upon the propriety of the extent of those requisitions. The Military Store Department might ask for ten wagons, and only really require three, yet get them; whereas the Commissariat might, at the same time, ask for twenty, which were absolutely necessary, and only get two. Who is to be the umpire when these questions arise? There is only one other point I will refer to, and that is, as to the lecturer's view of the duty of Commissariat Officers being analogous to those of Quartermasters. I can only say Colonel Shervinton's acquaintance with the Commissariat Service must be very imperfect, if he can compare the duties of a Department charged with providing, conveying, and distributing the supplies of an Army in peace and war, with those of an Officer who simply has to receive daily supplies in a barrack store and distribute them to his regiment. There can be no possible analogy between the two things.

Mr. Wellesley Robinson: With reference to the transport for the Army, no doubt everybody in the Commissariat as well as in other branches of the Service is of opinion that it ought to have a military organization; but is there any reason to say that it has not a military organization at present? It surely has, for the whole of the Army Service Corps—the nucleus of the Army Transport—is military. The recent reorganization of the Commissariat and Transport Departments was especially intended to make the Officers, as well as the whole Department, more distinctly

military than it had been before. That intention should be worked out to the end, and make the Commissariat and Transport Staff entirely military. As to how far the Transport, the nucleus of which we have in the Army Service Corps, is likely to meet what is required of such a service in war does not, I think, depend upon whether it is a Transport under the control of the Commissariat, or whether it is a distinct organization. The Military Train, as it was in 1869, just before the Control Department was formed with the same number of horses, had smaller working power than the present Army Service Corps Transport; it had fewer *draft*-horses, and was much more expensive. The augmentation of the Commissariat and Transport Staff in South Africa during recent and present operations, or that must take place at any seat of war, is carried out in exactly the same way as would be necessary if the Transport were a distinct service, such as the Military Train was. The only question is, under whose administration is it to be? As far as the Commissariat are concerned, speaking from experience on active service, we have quite enough of our own work, and having the transport for the whole Army is an enormous addition to our responsibility. Whether Army Officers temporarily attached would work better in distinct Transport Service I doubt very much, because they seem perfectly willing to come and work as it is at present. We have seen that the Transport, as part of the Commissariat Department, did its work well in the Zulu War, and it was chiefly officered from the line. The lecturer expressed his opinion that the union of Commissariat and Transport at present existing—which he compared to that of the Siamese twins—should cease. I am not aware of the fate of the Siamese twins, but remember it was generally accepted that if the ligature uniting them was severed, the consequences would be disastrous to both, and those interested in them also. His simile is therefore, I venture to think, better adapted to my opinion that the Commissariat and Transport ought not to be severed, and that the result of having a Commissariat without a Transport of its own, on which it can perfectly depend, must be disastrous. In the Russian, the Austrian, and Prussian Armies, whatever the administration of Transport of the first line may be, they all have their Commissariat Train, their large field magazines, entirely Commissariat; and as to the Russian Army we can recognize what a very serviceable Transport theirs must be when we see it working right into Central Asia. Their Transport not only does Commissariat work, but all the Army Transport required for the whole force, movement of stores, carrying the sick, and every description of transport work. Any failure in supply is naturally attributed to the Commissariat, but as in the field their power to furnish supplies is entirely dependent upon the transport, it must be evident that Commissariat supply without transport is an impossibility; and if those who are to furnish the supplies are to be dependent upon another branch for transport, they will no doubt still get the blame in the event of failure, but without meriting it.

Mr. GRATTAN: I have seen some service as a Commissariat and Transport Officer; latterly in the charge of the transport of a division in Zululand, and, to my mind, many of the breakdowns that are attributed to the Department to which I belong, are due in a great measure to want of sympathy on the part of the combatant branches of the Service.[1] The roads and drifts were in many places in a terrible condition, and they were allowed to continue so, although a few fatigue parties could have improved them sufficiently to save many valuable animals. I made many suggestions, and they were approved by the General Officer commanding, but I had no authority to enforce them, and they became practically a dead letter. Unless a Transport Officer is endowed with power to give orders in connection with his own

[1] One instance out of many will suffice to illustrate my meaning. I was once on the march in Zululand with a convoy, and I observed that the head of the column was halting on the near side of a hill; I galloped up to the Officer in command of the escort, and suggested that the convoy should be allowed to move on to the level ground above. My suggestion was not adopted, with the result that some wagons stuck in a swamp at the foot of the hill, and I had to double and treble span to get them out, some of the oxen dying in the struggle. Had it been a Royal Artillery Train, I have no doubt the Officer commanding the escort would not only have acted as I suggested, but he would have put his men to the drag ropes, and if needful he would have put his own shoulder to a wheel.

particular branch, he is deprived of more than half his usefulness. I have seen tens of thousands of pounds worth of mules and oxen lost for want of the two things I have mentioned, "sympathy" for my branch of the Service, and my inability to give "orders" in connection with the treatment, care, and working of the animals. With regard to organization, we have horses and wagons at home; in the last Ashantee War we had carriers; our horses and wagons would not have been of any use there, and neither our home nor Ashantee transport would have fully answered for Zululand; we must therefore organize according to the circumstances of the country in which we may be fighting. As to learning the duties, who has a better opportunity of doing so than the Commissariat Officer? He has to serve in every country, and has charge of the transport at all foreign stations; he is therefore acquainted with what is required when war breaks out. We are weak in numbers, and when war comes assistants are given us who know little, if anything, of the work they have to do. For the transport of a division, I had in addition to one Officer and two conductors belonging to a company of the Army Service Corps, one Assistant Commissary, a line subaltern, a Captain of Militia, two retired Captains, and some drunken civilian conductors; one of the retired Officers and the Militia Captain went down with typhoid, and I received a Sub-Assistant Commissary in their places. We had between 5,000 and 7,000 animals to manage, and we had not a single breakdown. I give this as an example of how Officers of the Department are usually worked, and I think it is somewhat ungenerous to put them down as inefficient and useless because here and there a breakdown may occur.

Colonel HALE: I am glad to bear my testimony to one instance in which the present system has worked perfectly without the slightest friction of any kind whatever. That was at Port Durnford. There the whole of the transport was under the Commissariat, and the way in which the various demands were met was by a conference every evening between myself, as the Officer of Line of Communication and Base, and the Senior Commissariat Officer as to the best way of meeting the requirements of the various Departments for the next day. I think I may say that the Commissariat Officer acted with the most perfect fairness all round.

Colonel SHERVINTON: I have very few words to say in reply. Mr. de Fonblanque referred to the service of the Military Train in China, and more particularly with regard to its possible use as light cavalry. You must all know that the position of light cavalry was not sought for by the Military Train. They were proceeding to do duty as Transport soldiers in China when they were diverted, without their foreknowledge, to India, and did good service there as the Army Service Corps has since done at Rorke's Drift and elsewhere in South Africa. It is not the fact the Military Train sought for the position of light cavalry either in China or elsewhere. The Commandant of the Military Train went to London if possible to stop the issue of light cavalry equipment; but Lord Herbert, the Secretary of State for War, insisted upon it, and wrote thus:—"To Lieutenant-General Sir Hope Grant, Commanding "the Forces in China.—Sir Edward Lugard mentions that the Military Train made "excellent cavalry in India when not wanted for train purposes. You will have "been aware of this, and may possibly find them again useful in their former "capacity." It was owing to his desire that the cavalry equipment was embarked, and was not sought for by the Military Train. Mr. de Fonblanque made a mistake with regard to the Auxiliary Transport. I never considered that the Transport nor the direction of the lines of communication should be a Commissariat service. The Auxiliary Transport before the enemy should be under the Commandant or Director-General of Transport. He alone should, under the commander of the forces (or whoever he may depute), allot the Transport in the proportion required by all the services in the Army itself, if indeed a Chief of the Civil Staff should not superintend the whole of the administrative services. The local transport, bringing in food to the depôts in possession of the Commissariat, is the only transport which the Commissariat should handle. The conveyance of stores from one depôt to another along the lines of communication should be done by the organized Transport, or that branch of it called the Auxiliary Transport. With regard to the employment of commissioned officers as Quartermasters with line regiments, it was not my idea; it was that of an Officer high in the Commissariat service propounded before a War Office Committee. I think I have already stated my high opinion of Commissariat

Officers, and spoken to the great responsibility involved in their duties, and the high ability which their service requires, and with which it has always been conducted. I do not know that there is anything further that I need add. I consider that the Military Transport is absolutely necessary. We have heard an Officer who has had experience at the Cape declare that there was a want of sympathy; there always is a want of sympathy, and it is a great misfortune; but what the cause of it is, is not for me to say, but I think it was more the want of organization than anything else. Mr. de Fonblanque told us rather a chaffing story about the horse artillery notions of the Military Train; but it is only fair to retort. I recollect after the Control was formed I was sent down to inspect an Officers' ride in the school. Now, I should have thought that after all that had been said, that cavalry drill was the last idea of the Control; but I found all the Officers at sword exercise learning the cavalry pursuing practice dismounted. What they were preparing for I do not know. When we come to a question of war we shall then have to draw ourselves together in the presence of the enemy; and I am afraid before we attain to an effective organization of Army Transport we shall suffer enormous losses.[1]

The CHAIRMAN: I think we have all listened with the greatest possible interest to the valuable lecture which has been delivered by Colonel Shervinton. He has announced his views in strong and emphatic terms, but I do not believe anyone can have very strong views upon any particular subject, whether upon Religion or the Army, without becoming a little fanatical, and therefore to express their fanatical views they must go a little further and express them in stronger terms than they would if they were speaking upon a topic in which they took no especial interest. We are, therefore, in my opinion, justified in exonerating Colonel Shervinton from any wish to impute discredit to the Department in which he has served so long, and in which I can say he has served with distinction. Several of the topics to which he referred include points regarding which there is great diversity of opinion in the Army. In the first place he alluded in his lecture to the existing Transport arrangements as if they were wanting in military organization. Mr. Robinson touched upon that point, and I think very properly so, because I can only say I have recently seen the Commissariat march past at Aldershot, and a finer body of men I never saw. It would be impossible for any body of men and horses and wagons to march past in more military form than I saw that corps march past the other day under my very highly-esteemed friend, Commissary-General Reeves, who did valuable service in South Africa. I quite agree that it would be utterly impossible in time of peace to keep up such a cadre of Transport that could be expected in time of war to the necessary dimensions; and as we have to carry on campaigns in so many different parts of the world, it would be utterly impossible to organize a Transport during peace that could be capable of carrying out the requirements of an army for war in every country. The requirements are so different in the West Coast of Africa, in South Africa, in Europe, in North America, and in many of the places to which we are obliged to send troops, that the same organization that would suit one theatre of war would be of little use, if not utterly inapplicable, in the other; at the same time I think nearly every one who has spoken or thought on this subject has agreed as to the absolute necessity of a military organization for whatever transport is made use of. Although it would be impossible to create a transport that would be useful in every country, there is no reason why the nucleus of a Transport Corps should not exist in England; and I think it does exist at the present moment, and we all wish it every prosperity, no matter who its Officers may be. It is merely a question of expense for the War Department to consider whether its numbers should be in-

[1] Deputy-Controller de Fonblanque mentions Major Gray, Military Train, as concurring with his views regarding the organization of Transport. Major Gray thus writes to General Sir Charles Staveley, K.C.B., Commanding:—

"Tien-tsin, 3/4, 1861.

"It is galling to a man in command of any corps to be dictated to on the subject "of military duty by one who possibly has not had half his experience, who could "not be expected to have the interest of the corps so much at heart as himself, and "whom he had ever regarded as one who could not, under any circumstances, lay "any claim whatever to military command."

creased to the proportions it ought to bear with reference to other branches of the Service. This military organization is one that cannot certainly be easily or quickly given to a large body of men collected, as the lecturer has very graphically described, in various parts of the world during war. It is absolutely necessary, whatever may be the kind of men and horses and material that are to constitute the Transport Corps, that military organization should be imparted to it in times of peace, and imparted to it at home or in India, wherever we have our standing Army. I quite agree with what Mr. Grattan said as to the utter impossibility of any Commissariat or Transport Officer receiving over a number of bullocks and a few drunken conductors with only a few Officers to control and supervise them, and being able to convert them into an efficient Transport Service, even in two or three campaigns. As far as I myself would venture to express an opinion upon the moot question of by whom the Transport is to be officered and worked, I rather concur in the views that have been expressed by some of the Commissariat Officers who have spoken. I think it is utterly impossible in war to dissever the Transport from the Supply services, although I must confess in working these two services together, I would keep their functions as distinct as it is possible to do so. If you remember the distance to which a line of communications behind an army is likely to extend, perhaps from 100 to 300 miles, you will see how utterly impossible it would be to send supplies along such a line, unless the man actually in charge of the transport had some interest in the stores which he was carrying. If you work in stages, which is the common way of working along a long line of communications, you go twenty miles and deposit your stores, which are then taken up by another train, and so on. How on earth can you have any continuity of responsibility unless every person concerned in the conveyance and carriage of these stores belongs in some way or other to the same Department? I think the lecturer, in his concluding remarks, has hit the nail on the head when he said we must have eventually some sort of Chief of the Staff of the Civil Department. My own idea is, although I am not at all in favour of copying foreign systems, rather to copy the system of the Prussian Service, which I do not think Mr. Robinson has accurately described. There has been quite recently published a most valuable General Order with reference to lines of communication, and to the manner of working them; but, unfortunately, in those regulations we have just stopped short of the most important point of all, and that is, as to who is to be responsible to the General Officer commanding in the field for feeding and supplying his army: I have no hesitation in saying the man who should be held responsible for feeding an army in front should be the Officer in charge and in command of the line of communications, as it is in Prussia and in nearly all the great armies of the world, and that it is only possible in that way to get over the friction which will always exist between the various Departments of the Army. It is necessary, in my opinion, that all these Departments should, like the strands of a rope, be brought together, as they would be under the Officer in command of the line of communications. This important Officer would have at every post and large town along the line of communications his representative, who, as commanding the station, would be the centre, the focus of these variously conflicting Departments, and who would give his instructions daily to their representatives on the spot. The Officer in command of the line of communications would take his orders from the General in the field, or from his Chief of the Staff, and would carry them out by means of his subordinates in command at the posts along the line committed to his care. By this plan, and in my opinion, by it only, can we hope to avoid all the difficulties of friction in departmental machinery which we know have invariably existed where no such plan has been adopted. Whatever may be our individual opinions upon this very important subject, I am sure we shall all agree that Colonel Shervinton deserves our best thanks for the very able and interesting lecture he has given us. I hope that the matter will be taken up and dealt with by the present Secretary of State for War when he has disposed of the many other important reforms which I am able to say he is shortly about to introduce into the Army.

NAMES OF MEMBERS who joined the Institution between the 1st January and 31st March, 1881.

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Gowan, W. E., Captain Ben. S. Corps.
Deane, George, Major late 1st Royal Scots Regiment.
Cecil, Lord William, Lieut. Grenadier Guards.
Carpenter, Alfred, Captain R.N.
Cockburn, C. J., Lieut. 6th Regiment.
Hope, John, Commander R.N.
Ramsay, F. F., Lieut. 92nd Highlanders.
Willoughby, Sir J. C., Bart., Lieut. Royal Horse Guards.
Martin, J. Harington, Lieut. R.N.
Baxendale, J. W., late Lieut. 1st Middx. Artillery Volunteers.
Noel, Robt. L. G., Lieut. R.N.
North, W., Major R.E.
Walker, P. F., Major 23rd Middlesex Rifle Volunteers.
Charteris, Hon. Allen D., Lieutenant Coldstream Guards.
Gaselee, A., Major Ben. S. Corps.
Hammond, A. G., Captain Corps of Guides.
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Brebner, James, Captain R.N.R.
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Ricardo, F. C., Lieut. Gren. Guards.
Crawley, Archer P., Lieut. Gren. Guards.
D'Aguilar, L. G. H., Lieut. Grenadier Guards.
Scott-Kerr, Robt., Lieut. Gren. Guards.
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Rosseter, H. D., Captain 106th Regiment.
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Parsons, L. W., Captain R.A.
Brunner, Henry, Captain 21st Lanc. Rifle Volunteers.
Tottenham, F. St. L., Captain 7th Rl. Fusiliers.
Bishop, Luke, Major 7th Surrey Rifle Volunteers.
Pretyman, Geo. T., Lieut.-Colonel R.A.
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Gascoigne, F. R., Captain Rl. Horse Guards.
Maunsell-Collins, W., Surgeon Royal Horse Guards.
Montressor, W. H. H., Lieut. R.N.
Cousens, John S., Major Tower Hamlets Engineer Volunteers.
Kirby, Alfred, Captain Tower Hamlets Engineer Volunteers.
Whetherley, William, Lieut. Tower Hamlets Engineer Volunteers.
Simpson, F. C. B. B., Lieut. R.N.
Bell, Lewis K., Lieut. R.N.
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FitzHenry, Claude B., Lieut. 4th Lanc. Militia.
Tarleton, E. D., Major R.A.
Teale, Ed. J. J., Lieut. 32nd Regiment.
Bowles, John T., Lieut. 32nd Regiment.
Keate, Chas. R., Lieut. 32nd Regiment.

OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Lieut.-Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

THE TRAINING OF INFANTRY FOR BATTLE.

In my paper on the "Tactics of Infantry in Battle," published in the last number of this Journal, I endeavoured to give an idea of the present state of professional opinion upon that all-important subject in the principal Continental Armies, and said :—

"After having described, as I propose, in the present paper, how our "foreign friends think battles should be fought by the infantry soldier, I hope, "with the editor's kind permission, to explain in a future article how they "train and educate Officers and men for this arduous work."

I am now about to undertake the second part of my task, and I think I cannot perform it better than by describing how this great work of professional training and education is carried out in a German infantry regiment, both because I believe it is the best possible example of how this work should be done, and because the German process is so well and clearly explained by the Russian Colonel, Baron Kaulbars, in his report upon the German Army in 1876, translated into French by M. G. Le Marchand, Capitaine d'Artillerie, from whose pages I have borrowed all that is necessary for my object, and to whom my thanks are due for enabling me through his translation to make use of Baron Kaulbars' valuable work.

N.B.—Notes marked "Trans." are by the French translator, notes marked "L. G." by myself.

Extract from the Preface.

The real characteristic feature of this (the German) Army, the aim which it constantly keeps in view in its drill and in its work, is the instruction of troops methodically and systematically directed to one sole object, *readiness for war*.

Extracts from the Chapter on Recruiting.

Recruits intended for the infantry of the line join their regiments in the beginning of December, those for the Imperial Guard in the first half of November.

. . . . . .

Tradesmen ("Oekonomie-Handwerker") for the regimental workshops join at the beginning of October, on account of the great amount of work required

at this period of the year in making up and repairing the clothing for the annual quota of recruits.[1]

It is a mistake to suppose that there are many members of the upper classes amongst the recruits. Amongst those I saw there were very few, or I may say hardly any. This is accounted for by the fact that almost all young men who have received a fairly complete education enter the Service as one-year volunteers, or as candidates for commissions.

All the recruits, however, seemed vigorous and in good heart, and they were kindly treated. It was interesting to remark that most of them had already received a certain amount of military instruction which was made evident by their style of walking, of turning about, of answering their superiors, &c.

. . . . . .

Every company receives annually from forty to fifty recruits, who are generally quartered apart from the old soldiers. Every room allotted to them is placed under charge of one of the non-commissioned officers or lance-corporals (gefreite) selected as instructors by the Captain.[2]

All these dispositions are, however, left entirely to the Captains, as we shall see further on when treating of the mode of instruction. The section formed by the recruits of a company is placed under direction of an Officer, and is divided into three or four squads to which are attached a non-commissioned officer and three or four lance-corporals. The latter are not always in possession of the stripe of their nominal rank, but are often chosen from

[1] The "Oekonomie-Handwerker," or "Handwerker ohne Waffe," (workmen without arms), answer to the "Section active" in the French Army. Those of a battalion are kept together, and attached to one of the companies for discipline. After three weeks' drill, they neither receive any further military instruction, nor perform any military duty, being entirely employed in the workshops. They are not allowed to prolong their service, unless selected as foremen, nor can they become non-commissioned officers.

The "Handwerker mit Waffe" (workmen with arms), are trained as well as other soldiers, and are available for all duties. They may either be employed with their companies in making small repairs, or on occasion in the regimental workshops as extra hands.—L. G.

[2] The establishment of a German company on the peace footing is:—

1 Captain.
1 First Lieutenant.
2 Second Lieutenants.
1 Sergeant-Major (Feldwebel).
1 Officer-aspirant (Portepeefähnrich).
4 Sergeants, 2 first class, 2 second class.
7 Corporals (Unterofficiere), 3 first class, 3 second class, 1 third class.
12 Lance-Corporals (Gefreite), and re-engaged men (Kapitulanten).
4 Musicians.
99 privates (including 2 extra musicians).

132—all ranks; besides
1 Hospital Orderly (Lazareth-Gehülfe); and
3 Tradesmen (Handwerker ohne Waffe).

Added on the war footing.

1 Second Lieutenant.
7 Corporals.
2 Musicians.
12 Lance-Corporals.
100 Privates; making up a total of all ranks,

258 combatants. L. G.

amongst the best soldiers of the preceding year, and particularly amongst those who are to be discharged at the end of their second year's service in virtue of what is called the "King's leave" (Königs-urlaub), a favour granted annually to from ten to twenty men per company as a recompense for good conduct and zeal. It may seem surprising that these good men are not rewarded with the rank of "gefreite," but it is an established principle in the Prussian Army to confer this rank, as a general rule, only on soldiers who are expected to prolong their service for the purpose of becoming non-commissioned officers.[1]

Some Captains again divide their recruits into parties of two or three, each under the care of an old soldier, a system which seems well calculated to promote the sentiments of comradeship and brotherhood which should unite all members of the great military family. Great care is, at the same time, taken to prevent a proper deference on the part of recruits to old soldiers from degenerating into servility. Soon after a recruit joins he is called upon to draw up a short account of his past life with the utmost possible sincerity and completeness for submission to his Captain, who thus gains the means both of knowing the antecedents of his men and of testing their intelligence and the degree of their education.

Illiterate men not being able to write their autobiography, have to repeat it *viva voce*, and the artlessness with which this is sometimes done is very curious. The illiterate recruit is now, however, as we shall presently see, a great rarity in the Prussian Army. Besides receiving their annual contingent of conscripts, infantry regiments are completed by one-year and three-year volunteers. But few of the latter, however, engage in the infantry, the only advantage gained by doing so being that of the permission to join at 17 years of age, thereby getting through their service at an earlier period. The number of one-year volunteers varies much in different regiments. In some there are a good many. For instance, in 1875 there were sixty-seven in the Grenadiers of the Guard (the Emperor Alexander Regiment). Some regiments quartered in small towns have at times none at all, whilst those stationed in university towns contain a large number.[2]

The Established Course of Instruction.

In most European Armies when the annual course of instruction is upon the point of commencing, a whole host of orders appears together with detailed regulations, defining with excessive minuteness the nature and duration of the different exercises, not only by the month and week, but sometimes even by the day and by the hour. Nothing of this kind occurs in the German Army, the commanders of companies having the whole and complete responsibility as to the training of their men, which they provide for each entirely as he thinks best. Their initiative is only limited by the obligation under which they lie to present their men at certain fixed periods for the inspection of their superior Officers, and to have brought them to a certain specified degree of progress on each of such occasions. The com-

[1] Such men, known as "Kapitulanten," can only re-engage from year to year. They may only be dismissed the Service against their own will, if degraded to the second class for misconduct, or if sentenced to certain specified punishments. After twelve years' total good service, they cannot be dismissed against their will. As a general rule, no soldier is promoted to be a non-commissioned officer, unless he be a "Kapitulant," and after three years' service.—L. G.

[2] Because university students can thus continue their studies whilst performing their military duties, every possible facility consistent with their military training being given them for doing so. The reserve and landwehr Officers' corps are largely recruited from the one-year volunteers, who are expected to qualify for a commission, or at any rate, for the post of non-commissioned officer in those forces.—L. G.

mander of the battalion is not allowed to interfere with the instruction of the companies. He may, of course, point out to the Captains any omissions or irregularity which may come to his notice, but he is expressly forbidden to order a Captain to follow one system of training rather than another.

Later on he will in his turn take his battalion in hand, and will then become entirely responsible for its tactical instruction. He has, therefore, a right to insist upon the training of the companies being by that time complete.

The same initiative is left to every Officer entrusted with any branch whatsoever of the soldier's instruction, and even to all non-commissioned officers, each within the limits of his functions. All Prussian Officers, from Lieutenant to General, are unanimous upon this point, considering the utmost possible development of individual initiative in all ranks to be the sole and indispensable condition of success, not only in what concerns the training of troops but in all that relates to military matters. This power of initiative doubtless promotes a feeling of emulation amongst Officers of all grades, developing a consciousness of personal ability, teaching them to decide for themselves, to extricate themselves from difficulties, and to form their own judgment as to the requirements of the Service. It would be impossible to find means more prompt or more certain for obliging every Officer to know thoroughly all that he ought to know, and no better scheme could be devised for his instruction. In the whole military hierarchy there is no grade of more importance, with reference to military training, than that of the commander of a company, squadron, or battery, and when a capable Officer has been appointed to one of these posts his hands should be left entirely free, for not only does he instruct the soldier, but from the position which he occupies he alone has the power of forming amongst his subalterns an Officer fit to succeed him. After the complete individual initiative left to all, the next thing which strikes an observer of the mode of instruction pursued in the Prussian Army, is the minutely progressive and methodical manner in which it is carried on, not only from the beginning to the end of the year, but also throughout each of its different periods. The authorities have arrived, by long experience, at formulating certain rules, and at fixing the time for each branch of training in a manner properly appropriate to the exigencies of war, as also to the national character and to the habits of the people. These rules which experience has sanctioned are never modified by any special order. Every actor knows his part, which he is taught once for all and performs it without hesitation. The higher powers take good care that the time allotted for instruction is not frittered away in useless drill. As few inspections as possible are made, and all Officers are strictly forbidden to make their men go through a preliminary rehearsal of what has to be seen by an inspecting Officer; the object of this prohibition being to prevent any encroachment on the time set apart for instruction. For the same reason superior Officers, instead of making inspections themselves, generally content themselves with attending those made by their subordinates. The most rigorous measures are taken to restrict the number of absentees to the lowest possible minimum. The consequence of all this is that the training of a Prussian regiment is conducted year by year in a steady, regular manner, exactly after the fashion of any well-regulated public school, where the pupils in like manner go every year through their course of work methodically.

The Infantry.

The annual course of instruction comprises six periods, arranged as follows:—

1. Preparatory period. From the end of the great manœuvres and the discharge of the reserve men (including both those who may have been called

out for training and those who, having completed their third year with the colours, are passing into the reserve) to the arrival of the recruits; that is to say, from the middle of September to the beginning of November in the Guards, and to the beginning of December in the Line.

2. Period of individual or recruit instruction, up to the middle of February in the Guards and to the beginning of March in the Line.

3. Period of inspection and of spring drills up to the middle of May. This period includes the inspection of recruits before their admission to the ranks of the company. Five or six weeks are then devoted to company drill, three or four to battalion drill, two to regimental drill, and one to brigade evolutions. There are no divisional exercises, as these would simply be the repetition of brigade evolutions applied to each of the brigades in turn, for the Germans never think of deploying the two brigades of a division at the same time in line-of-battle without a reserve.

Divisional evolutions would, therefore, come to this: you would be keeping one of the two brigades in reserve doing nothing while the other was manœuvring.

4. Period of field exercises, which lasts to the beginning of August.

5. Period of autumnal exercises which extends to the end of August. These exercises, which must not be confounded with the "autumnal" or "grand" manœuvres, are only the repetition during one or two weeks of the regimental and brigade evolutions of the third period.

6. Period of the grand manœuvres, lasting to the middle of September.

Such is approximately the direction, somewhat variable be it understood, of the different periods of instruction which we shall proceed to examine in succession. It may appear surprising to some of my readers that no special period is indicated for musketry instruction. The fact is, that this is carried on continuously throughout the year.

1. *Preparatory Period.*

After the departure of the reserve men and after a rest of some days, all necessary preparations are commenced for the reception and instruction of the recruits, as also for the general training of the regiment.

The military operations comprise:—

1. The selection and preparation of the instructors intended to train the recruits.

2. The cleansing and repair of the uniforms to be worn at drill.[1]

3. The appropriation of rooms to the recruits.

All these matters come under the immediate supervision of commanders of companies, and have to be looked to thoroughly before the arrival of the recruits.

During this period the most important considerations for the Captain are the selection and preparation of the instructors to whom he is going to confide his recruits, for upon his judgment in this respect their future efficiency mainly depends, and as, owing to the short term of service with the colours, it is difficult to have a sufficient number of experienced non-commissioned

[1] That is to say the clothing, generally very old, which is distributed to the recruits on joining, and which is worn by them only at drill, or on fatigue.—TRANS.

Every Prussian soldier has two complete suits of clothing in his possession for ordinary use, besides which, the Captain retains an entirely new suit (No. 1) for each man, to be issued only if going on active service, and the other good suits (Nos. 2 and 3), one of which to be worn only on grand parades, the other on high days and holidays. All clothing is the property of the company, not of the individual. For complete information on this point, the reader is referred to Captain Le Marchand's translation, pp. 378—398.—L. G.

officers for this purpose the Captain's whole time and care during this period are devoted to preparing those he has for their duties.[1]

In each company, as a rule, one Officer, three or four non-commissioned officers, and from six to nine lance-corporals are told off as drill instructors.

The Captain confides the post of chief instructor to the Lieutenant who appears to be most fit for it. This Officer then directs the training of the recruits under the immediate supervision of the Captain, who, however, makes a point of giving him the utmost possible latitude, upon the principle that such freedom is essential to successful instruction, besides being the most likely means for preventing the Officer charged with this duty, in itself so trying both physically and morally, from becoming disgusted with his work. In return for this liberty of action the Officer instructor becomes entirely responsible for the men entrusted to him. He has to look after them and to see that they are not brutalized by contact with the old soldiers. He sets an example of politeness towards the recruits to the non-commissioned officers and lance-corporals who are under him, urging the latter to the zealous performance of their duties, whilst he represses all violence and roughness on their part towards the young soldiers.

In order to qualify himself for this work, the Lieutenant finds it necessary to train himself thoroughly for it during the preparatory period. He goes over in detail all regulations affecting interior economy, and the different branches of individual instruction, and does his best to remedy defects in his own practical training. In doing so, he has recourse to the counsels of his Captain, on whose experience he can almost always rely. The Captain on his side is always ready to assist his subaltern, by giving him friendly advice, yet without taking personal charge of his instruction, the very task which devolves upon the latter obliging him to study thoroughly all that is necessary for him to know, in order to acquit himself of a mission as important as that of the young soldier's instruction.[2] As for the non-commissioned officers, the Captain tries to pick out one or two who have already proved their fitness as instructors, and one or two others who are not too young, and who appear promising. By this means he gains two objects at the same time ; first of all, he provides his recruits with experienced instructors, and secondly, he prepares others for the next year. This rule is not absolute, but it is generally applied as far as possible. As we have already remarked, the young soldiers of each company form a separate section, divided generally into three squads, each of which is confided to a non-commissioned officer instructor who is quartered, if possible, in the same room with the recruits under his charge. Each non-commissioned officer has under his orders three or four lance-corporals who are, like himself, exempt from all other duty during the preparatory period and that of individual instruction. These lance-corporals assist the instructor in his functions, and are charged par-

[1] The difficulty of ensuring a good supply of non-commissioned officers has been very great of late years in Germany as elsewhere, in consequence of the great inducements held out to steady, intelligent men of good education to leave the Service. Steps have been therefore taken to counteract the temptations of civil life, both by raising the non-commissioned officer's pay, increasing his comforts whilst in the Army, and by ensuring him a good appointment on his leaving it, after at least twelve years' service.—L. G.

[2] It must be remembered that every German subaltern has gone through a very complete course of professional training, before he is called upon to instruct the young soldier. First of all, six months' service in the ranks, ending with an examination as to his fitness for the Service, and as to his general education ; next, a course of military training in a "Kriegs-schule" (war school), ending with a Service examination. After passing which, he receives his commission, unless rejected for substantial reasons, by the Corps of Officers.—L. G.

ticularly with the task of making the recruits acquainted with all regulations respecting their barrack duties.

As it often happens that a section of recruits is quartered in several different rooms, a lance-corporal is told off to each of them. He acts the part of an old comrade towards the young soldiers, living in intimacy with them, and striving to inspire them by his example with military spirit, and with the sentiments of honour and discipline. On that account no one is appointed to one of these posts unless he be not only well acquainted with his duties, but of good character and good humour. The Captain must needs be very particular in his selection, as upon it depends in a great measure the successful issue of the training. He must, moreover, take an active part in perfecting the education of the instructors whom he has chosen, so that they may be able to acquit themselves thoroughly well of their difficult missions. He has indeed six weeks at his disposal for all this, so that he may change his men if he finds they do not answer.

He devotes on an average two hours a day to the theoretical instruction of his instructors, commenting in their presence on the various drill regulations, on the theory and practice of musketry, on interior economy, &c. Besides all this, he tries to give them some notions of a wider character, by going over with them the historical records of the regiment, and by teaching them the general principles of military law. During the rest of the time he gives them practical instruction, either himself or through the Lieutenant. He accustoms them to command, to correct mistakes, and to give instructions either to one another, or to squads of old soldiers told off for the purpose.

Neither is it a light task for the Captain to have all the clothing and other effects necessary for the recruits put in order. This must, however, be done before they join, so as not to lose a single day of the period devoted to their instruction. On this account, the tradesmen recruits join, as has already been noted, by the 1st October, so as to replace immediately those who have passed into the reserve. These workmen receive no military training, except what is required to make them turn out properly in uniform, to pay proper respect to their Officers, and to observe the rules of discipline. As these men are all professional tradesmen, they can at once set to work, being assisted in the details by the company workmen. The oldest and shabbiest clothing in the company's stores is picked out from amongst the things worn at the last autumn manœuvres. After being thoroughly cleaned, the clothes are repaired as well as possible, fresh braid, shoulder straps, facings, &c., being put on. The suits thus made up are intended exclusively for use in barracks, and at drill; in some companies, indeed, the Captains try to give their men two suits of this kind, so as to have a change in case of rain. These uniforms are generally the fifth and sixth suits provided for the Prussian soldier, not to mention the canvas jacket and trousers, which he also has, and which he generally wears at the summer drills. Every endeavour is made to give the best possible appearance to this fatigue dress, so that the recruit may wear it without repugnance, and that when he looks at himself in his glass, he may be satisfied with his own appearance, for first impressions are everything.

Then again, the recruits' rooms are got ready, the old soldiers being turned out of them, walls being whitewashed, furniture repaired, &c. Lastly, during this preparatory period, when the effective strength is reduced to two-thirds of the peace establishment, and during which guard duty falls very heavily upon the men, the old soldiers can only receive musketry instruction, and practise some of the details of field service, non-commissioned officers learn to conduct patrols, to make reconnaissances, and to practise minor tactics in the field. Officers likewise have tactical field instruction[1]

[1] What both French and Germans call instruction on the "Terrain," as distinguished from barrack square, or parade ground drill.—L. G.

under the battalion commander. The regimental pioneers are at the same time instructed in sapping.

2. *Period of Individual Instruction.*

A. *Recruit Drill.*

The day on which the recruits join is without doubt the most important of the whole year for the Captain. Will the new contingent be as good as that of last year? Will it be better or worse? Such are the questions which occur to every Captain who is anxious to keep up or to raise the reputation of his company, the efficiency of which must be affected during the whole ensuing year by the result of the recruits' instruction.

Hence the Captain is forcibly induced either to continue the system of instruction which has succeeded the previous year, taking advantage of the lessons of experience to give it still greater perfection, or, on the contrary, to profit by the example of his colleagues whose systems may have produced better results. The most essential part of a Captain's duty is to direct the non-commissioned officer and lance-corporal instructors by impressing upon them the rules which should guide their relations with the recruits, and by insisting upon the observance of those rules. He tries to make them understand the necessity of avoiding all roughness and the use of offensive language, lest the recruit should become disgusted with the service and imbibe false ideas of the relations which should exist between the Army and the other classes of society. For example, the instructor should never taunt a recruit with his low birth; on the contrary, he is bound to show the same impartiality towards all, high or low, so as to arouse in them those feelings of comradeship which ought to pervade the whole military family, whose united efforts should be directed to the same object. The instructors will be reminded that they will succeed better with the recruits by kindness and proper treatment than by harshness and the abuse of punishment. The lance-corporals are especially the objects of the Captain's supervision. As yet, less experienced than the non-commissioned officers, not being, like them, in the habit of explaining themselves whilst imparting instruction, they are more likely to lose patience when misunderstood, and to show their impatience by abusive language and even by blows. For this reason they are always directed to keep at a distance from the men whom they are instructing, explaining what they have to teach by word of mouth and by gesture.

They are not allowed to approach a recruit, except on rare occasions for the purpose of correcting his position, and this must be done quietly, for the least touch may easily degenerate into a push or something worse. Every instructor should bear in mind, particularly at first starting, that he is a teacher even more than a superior. The young soldier will thus be naturally led by the esteem and consideration inspired by his instructor in the former capacity to understand and practise the obedience due to him in the latter.

Such are at least the general principles which regulate the instruction of the German Army. They are understood and observed by the superior military authorities, as well as by most of the Officers and non-commissioned officers. The heads of the Army use their best exertions in support of the regulations, and circulars are issued for the purpose of banishing all brutality from the Service.

So as not to hurt the feelings of the men, and so as to prevent undue familiarity between superior and inferior, the former are expressly forbidden to use any pronoun but "sie" in addressing the latter. The use of the pronoun "du" is not allowed even when off duty. Officers say "sie" to their orderlies. Sergeant-majors and other non-commissioned officers observe this rule, even when evidently speaking with some degree of heat. Lastly, all Officers and

soldiers, even when members of the same regiment, use the pronoun "sie" when conversing together. "Du" is used between relations and very intimate friends, and then only when not conversing on matters of duty.[1]

The course for recruits lasts, as we have seen, from twelve to fourteen weeks according to the wishes of the regimental commander. We will now see how it is regulated and conducted in the Prussian infantry.

The question is how in twelve weeks to transform a recruit into a soldier, that is, to teach him to fight in extended order, how to handle his arms, how to shoot, and to perform gymnastics; in short, all that is required to make him fit to take his place in the ranks of his company, to take part in military movements, and to perform all duties required of the soldier in peace time. It is evident that in order to arrive at this result the Captain will have to use all his energy, and that his experience will be severely taxed to work out all his plan of instruction, and to establish the mode of progression to be followed. Strict adhesion to a system of progressive instruction is doubtless the first condition of success under the circumstances. This truth is admitted by all, great and small, in the Prussian Army, and the higher authorities take very great care to prevent anyone from interrupting or interfering with the regular succession of exercises during the period of instruction. We must not omit to mention as the most characteristic feature of the system the extreme attention paid in all matters to the development of intelligence in the recruits. No instructor is allowed to give a word of command of any nature without at the same time explaining the object and the utility of the movement contemplated. This explanation is of peculiar importance in the instruction of recruits, to whom, in its absence, a great number of words of command would be incomprehensible and would appear useless. Moreover the Captain, taking into consideration the great strain both bodily and mental to which the young soldier is subjected in going through exercises to which he is not accustomed, understands that he would run the risk of overtaxing his strength, and of compromising the success of the training, if he were to allow the drills to be too long at first. For this reason instruction is conducted throughout the German Army in an extremely methodical and wisely progressive manner, down to the minutest details. Let us also note the fact that no regulations have ever been issued by superior authority to govern the instruction of recruits. In all circulars and regulations in existence the writer has confined himself to pointing out the object to be attained whilst carefully abstaining in principle from everything which might bear upon the details of execution. It is for the immediate chief, that is, the regimental commander, to decide up to what point the instruction of his men is to be carried during such period, whilst all that relates to the actual process of instruction, to the distribution of the time devoted to it, to the progression to be followed, is within the province of the company commander. Full and entire freedom is left him with regard to such matters, and his superiors religiously abstain from any measure which might put a limit to his initiative. There is indeed no difference of opinion as to the fact that we are sure to carry out with greater zeal and pleasure a system of instruction which we have ourselves elaborated, thereby arriving at a more or less successful result in less time than by following a course, even

[1] It may be useful to explain for the benefit of any reader unacquainted with the German language, that formerly the pronoun "Sie" was exclusively used to signify "You," in ordinary conversation between equals, or by an inferior addressing a superior, whilst "Du" (Thou), was in use, as it is still, between relations and intimate friends, also by a superior addressing an inferior. The pronoun "Er" (He), was also used in the latter case, when the superior was speaking haughtily or angrily. These distinctions are now happily fast disappearing, and in all classes of society, the polite "Sie" is almost exclusively used, the "Du" being only retained for intercourse between relations and intimates.—L. G.

may be a better one, which has been imposed upon us by authority. The Captain must, therefore, in all such matters decide for himself, consulting his own experience and that of his colleagues and superiors, not to mention the numerous treatises on military education in which German literature abounds, treatises written by the most experienced Officers, and in which every chief who has at heart the efficiency of his men will find excellent precepts and rules sanctioned by experience.

Most of the Captains arrange the course of instruction by weeks, fixing a general scheme for each week, and leaving all details of execution to the Lieutenant instructors. They endeavour above all to make the latter understand their method, and give them all necessary explanations upon points which may not be clear to them. The Lieutenants in their turn make their wishes known verbally to the non-commissioned officers, taking care to leave to them also a certain initiative. It has been my fortune to be several times present as a spectator at recruit drill, and I could not help admiring the zeal with which everyone devoted himself to his task, and the manner in which it was accomplished. Here, for instance, we see the recruits of a company divided into small squads under the instruction of non-commissioned officers and lance-corporals. The Lieutenant goes from one squad to another, following with attention the movements of his men and observing the manner in which the non-commissioned officers impart instruction. If he remarks anything wrong he never addresses himself to the soldier who is in fault, but to the instructor, whom he directs to correct the error. It is only when he is misunderstood that he himself corrects the recruit's position. The Captain is to be seen walking up and down at a little distance, having an eye to everything, but only speaking to his Lieutenant, whose attention he contents himself with calling to one point or another. Then, again, the commander of the battalion and that of the regiment appear from time to time; they give a rapid glance at the proceedings as they pass, without, however, stopping long at any one place, for they would fear by staying too long near a company to interfere with the Captain's independence, and to shake the confidence which his soldiers should have in him. The weekly programmes of which we have before spoken are by no means obligatory, and some Captains prefer regulating the course day by day, according as they find it convenient; but the object which all have in view is to draw up a scheme of instruction so well graduated as not to tire the young soldiers beyond measure, and not to disgust them with their new profession from the very commencement. Thus, for instance, the men will have during the first week two hours' drill in the morning, and an hour and a half in the afternoon; in the second and third weeks two hours and a half in the morning, and two hours in the afternoon; in the fourth week two hours and a half both morning and evening. Before each drill, non-commissioned officers and lance-corporals inspect their squads to see that they turn out properly, and this is done sufficiently early for the drill to commence at the hour named by the Lieutenant. The recruit is under constant supervision, so much so that during the first six weeks of his service he is not allowed to leave barracks unless accompanied by a lance-corporal. This is a rule of some importance, particularly in the large towns, where inexperienced youths might easily be led into situations derogatory to the honour of the uniform. And now before examining in succession the different branches of instruction, it is well to explain under what conditions it is carried on. In the infantry, drill halls are the exception, and those in existence are not warmed. Consequently drill is carried on, no matter what the weather, and even in winter, in the open air and without overcoats. The men are all so hardy that they rarely make use of them. It is doubtless to this that we must attribute the ease with which German troops bear life in bivouac; witness the sieges of Metz and of Paris, during which the percentage of sickness was relatively small.

Individual Drill and Elementary Formations.

The principles of marching are taught individually, and always by a non-commissioned officer, whilst the lance-corporals give instruction in the manual and firing exercises, the turnings, extension, and closing of files, dressing up and back.

The manual and firing exercises are taught individually during the first five or six weeks, then to all the recruits together, the men being placed in several ranks at one pace interval. As for the turnings, alignments, &c., instruction is given from the very first in small squads, formed of men placed in like manner at one pace interval.

Then, towards the commencement of the eighth week, non-commissioned officers repeat this instruction, taking the whole section together in close order. These drills serve as introduction to movements in close order, which are taken in hand at the commencement of the eleventh week. All the recruits of a company then form a section three deep, which is drilled by the Lieutenant in person. This, by the way, is only an example to illustrate one of the usual methods of proceeding, for there is nothing obligatory about it, and many Captains act differently. In one and the same regiment you may find a great variety of views taken by different Captains, and of systems adopted by them with regard to instruction, and particularly to the order in which the different branches of it are imparted. Thus many Captains begin the manual exercise on the third day, because they think that this exercise strengthens and develops the muscles of the chest and arms, and that, in consequence, aiming and, further on, shooting come more easily to the recruit. Other Captains, again, depend more upon gymnastic exercises, and will not allow a rifle to be placed in a soldier's hands till the fourth or even the sixth week. In all cases the battalion and regimental commanders rigorously abstain from interference, and leave full liberty to the Captains. It sometimes happens that a Colonel, seeing two of his Captains differing entirely in opinion, and each instructing his men after his own fashion, says openly that he is watching the result with the deepest interest, and that he is looking forward with impatience to the day when the inspection of recruits will prove which of the two systems has answered best. It cannot be denied that such a course of proceeding on the part of a Colonel is the best way of urging his Captains to do their utmost physically and morally to gain their end. The instruction of their recruits becomes thus a great source of emulation for the Captains, and its various phases are followed by the higher authorities, and sometimes even by military writers, with keen interest; at all events, you always arrive in the end at having well-trained soldiers. This liberty of action, be it understood, does not go beyond the method and the progress of instruction. As regards its nature, that is fixed by regulation, and must be strictly adhered to.

Skirmishing Drill.

Instruction in this branch begins from the second week, and is given daily for an hour and a half. During the first six weeks, non-commissioned officers drill their squads separately in acting upon the bugle calls sounded by order of the Lieutenant, who takes post some distance in rear. From the seventh to the tenth week this instruction is only given every other day; and starting from the eleventh week the Lieutenant assembles all the recruits of the company in one body, each of the squads forming a section two deep.[1] The three sections are drawn up one in rear of the other, forming a little company column, which the Lieutenant drills as if it were an entire company. The

[1] It may be as well to remind the reader, that though the normal parade formation of the German infantry is three deep, its fighting formation in close order is two deep.—L. G.

men come in this manner to understand the relations which exist between close and extended order, as also the movements and formations peculiar to the former. This is the best preparation for company drill, to which they pass generally towards their thirteenth or fourteenth week.

Position and Aiming Drill.

Half an hour is devoted to these matters daily. The recruit is first taught to aim with the use of a rest, being placed in front of a target so as to get the habit of aligning his sights with any point indicated by the instructor. He is then taught to take aim standing with free arm, then kneeling and lying down. At the same time the lance-corporals explain the mechanism of the rifle and how to keep it in order, to take it to pieces, to put it together, &c. From the fifth week, recruits begin practising with dummy cartridges. As for actual target practice, it is not easy to say when it commences for the recruit, the exact period differing much according to the special views of the Captain, so much so that when the time comes for the inspection of the recruits the men of some companies have only fired ten rounds of ball cartridge, whilst others have fired as many as forty. We shall return to this subject in the chapter specially devoted to target practice.

Gymnastics.

Under this head are comprised :—

1. Extension motions, divided into three series of increasing difficulty, each including movements of the head, body, arms and legs, also standing and running jumps, running, &c.

Instruction is given in gymnastics for ten or fifteen minutes at a time, first of all in combination with the individual drill, serving thus to relieve its monotony, but later on by itself.

2. The same movements are practised with the rifle, special arms, called "fencing arms," being provided for that purpose. These are generally rifles which have become unserviceable, heavier than the "Mauser," and with buttons on their bayonets. The young soldier is thus trained to handle a less handy weapon than the one he will have to carry on service, which must be a good preparation.

3. Fencing with the bayonet, or rather the preparatory movements of the same without arms. Actual fencing is not part of a recruit's training. The instructor, however, always has a rifle in his hand so as to make the men understand the object of the motions which they are ordered to perform. These different drills are minutely regulated in the programmes drawn up by the Captains, each of whom fixes upon the method and order of proceeding which seem to him the best.

4. Gymnastic exercises with mechanical appliances, the principal of which are the vaulting bar, the vaulting horse, the elastic ladder, the vertical pole, and the horizontal bar. These exercises last three-quarters of an hour each day. During the first four weeks the men of each squad are all drilled together by their own non-commissioned officer. They are afterwards divided into two classes, each of which is under a lance-corporal, one being composed of the most active the other of the less active men. All these exercises are of an essentially practical nature, and at each exercise an explanation is given by the instructor of the use to which it may be put on service, so that the soldier may be able hereafter to utilize his gymnastic knowledge in overcoming the obstacles which he may encounter in the field.

Instruction on the Repair of Clothing and on the Care of Arms.

Instruction under the former head is given to the men of each squad by a tailor told off for the purpose from the regimental workshop. The men learn

under his directions how to make all small repairs for themselves. A lance-corporal superintends, a part of whose business it is to teach the young soldier how to clean his arms and how to keep them in good order.

Instruction in Bugle Sounds.

This takes place usually of an evening. A bugler posted in the middle of the barrack yard sounds the different calls at stated intervals, and the lance-corporals explain their meaning to the men who are assembled in the rooms. The time set aside for cleaning appointments is often utilized for this purpose. Often, too, the men are practised in singing choruses so as to make the time pass more agreeably whilst they are employed in repairing clothes or in cleaning arms.

Theoretical Instruction.

This deals principally with military obligations, interior economy, field service, and the theory of shooting. There is no official treatise, but a whole host of manuals upon the subject, that generally used being Weissheims's "Dienstunterricht des preussischen Infanterie-Gemeinen." The Lieutenant always takes in hand this branch of instruction, giving it once a week during the first four weeks, twice a week during the second four, three times a week during the last four. This rule is not absolute, but the general principle is observed of increasing the number of drills as the course progresses. It is the business of the Officer in charge to regulate details. He has also to make his men acquainted with the Articles of War, and particularly with those which are of immediate interest to them. He draws up his own scheme and submits it to the Captain for his approval. Instruction is given in the form of verbal explanation combined with numerous questions put suddenly to the men, who are thus kept constantly on the alert. Captains are alone responsible for the distribution of the time amongst the different exercises, and their arrangements are of infinite variety. We give, as an example, the following scheme of instruction drawn up for the first week of the course by one of the most experienced Captains in the German Army, and we add to it a scheme for a day's work during the fourth week.

Order to be pursued in the Instruction of Recruits during the first week.

1. *Length of drills.*—Daily from 8.30 to 11.30 A.M., including the time taken in going to and from the drill ground, and an interval of 20 minutes for rest at about 10 A.M.

2. *Dress.*—Forage cap; neither arms nor accoutrements. The men to be minutely inspected before marching off. The old soldier (lance-corporal) entrusted with the superintendence of the squad will be held responsible for any irregularity. The men will thus become accustomed to cleanliness, which is the soldier's first virtue.

3. *Drills.*—Position of the soldier without arms and marching at ease; changes of direction; marching on a point; dressing up and back. Explain the principles of alignment both forward and backward; the different individual movements should be taught each man separately and without any words of command, as they would not be understood by the recruit, who does not as yet know their meaning. He must first be placed correctly, and then he must be told the different words of command corresponding to each position. See that the soldier when marching has a military bearing, but that he moves with ease and without stiffness. Lance-corporals should always remember that example is better than precept. Make the recruit take short steps at first, then lengthen them little by little, slightly pointing the toe. It is better at first not to allow the recruit to place his hands close to his thighs, as this is

apt to give him a stiff, constrained position. Only have recourse to the balance-step in the case of awkward men.

4. *Salutes.*—Practise first saluting with the hand, then marching with eyes straight to the front, then halting and fronting. Do not try the third mode of saluting during the first few days, as its proper execution requires some preparation.

5. *Extension motions.*—Make the soldier stand at attention with his hands close to his thighs, raise and lower the toe, bend the knees, raise each foot in turn. All this is a preparation for marching in time. Practise movements of the body. Carry the arms forward, backward, and sideways, counting out loud at the same time. Turn the head right and left. The greatest attention should be paid at first to these motions. Let them always be practised an hour before and after dinner. They develop the muscles, give flexibility to the joints, and form the best preparation for the more advanced exercises. Never make the recruit perform any motions without explaining to him the object of them, and what part of the body they are intended to develop. The lesson is then better understood and becomes therefore more instructive. At first starting each man should be instructed separately.

6. *Theoretical Instruction.*—General indications on military life. End each drill by an explanation of the bugle calls. Patience is at this stage the principal requisite in the instructor. The Lieutenant should carefully superintend the non-commissioned officers, whose explanations are not always very clear in consequence of the little confidence which they have in their own knowledge, a very natural circumstance considering the short duration of their service.

Scheme for the distribution of a day during the fourth week of the course.

A.M.		P.M.	
6.	Rouse.	1.45.	March off for drill.
7.	Breakfast.	2 to 3.15.	Field exercise.
7.30 to 8.30.	Theoretical instruction.	3.15 to 4.	Gymnastics.
8.45.	March off for drill.	4 to 4.30.	Aiming drill.
9 to 9.30.	Aiming drill.	5.30 to 6.30.	Repair of clothes and care of arms.
9.30 to 11.30.	Field exercise.	6.45 to 7.	Bugle calls.
Noon.	Dinner.	7.	Supper.
		9.	To bed.

B. *Drills for Old Soldiers..*

During the two periods which we have been describing, that of preparation and that of individual instruction, it stands to reason that neither recruits nor instructors do any guards, fatigues, &c. The whole duty thus falls upon the old soldiers from September to the middle of February. Their number is also at this time reduced to a minimum for the reasons previously given. Thus in large towns duty men have not more than two or three nights in bed, besides having to perform all sorts of fatigues. In consequence of this, Captains can very rarely get hold of all their men, and the old soldiers are only available for individual instruction. All that the Captain can do is to dispose of them in such a way as to prepare them best for the spring drills. A great part of the time is devoted to target practice, to gymnastics, and to theoretical instruction, besides which the men are assembled in small squads and practised in field duties, under the direction of the Lieutenant, to whom this branch of the training is specially confided. Moreover, non-commissioned officers who show intelligence and aptitude for the service of reconnaissance are sent into the country with small detachments, to act as patrols, &c. In accordance with the same principles of independence, which admit of the intervention of superior Officers only if the Captain resorts to measures which are evidently bad or

contrary to regulation, the latter is at liberty to arrange the course of instruction given to his old soldiers just as he thinks fit, both with regard to the nature of the drills and the amount of time to be devoted to each. The only obligation which devolves upon him is to present his company at certain stated times to the Field Officers for inspection, when he must be prepared to satisfy their requirements. The Captains have to devise the best means for attaining the end which is thus put before them, and to adopt the best course of instruction for teaching their men what they have to know. No superior, not even the battalion commander, interferes to direct their proceedings or to restrict their liberty. The printed instructions only point out the result which they are expected to attain. The only exception to this rule, and that even within certain limits, is in the case of musketry instruction. On this important point official instructions are a little more precise, and certain rules are laid down concerning the course. But military literature abounds with studies and works of all kinds upon these different questions, and, thanks to them, a Captain, aided moreover by his own experience and by the counsels of his colleagues, may arrive at solving the problem, of such capital importance to himself, how best to instruct his company. We will give a sketch of the method and means which long experience has caused to be generally adopted.

Theoretical Instruction.

We may first observe that, thanks to the generally high level of education in Germany, this branch of a soldier's training may be much simplified, it being possible to omit everything relating to primary instruction properly so called. The illiterate form, indeed, an almost insignificant minority in the Prussian Army, since out of all the recruits incorporated in 1874, there were only 3,116 (3·72 per cent.) who could not read or write; and, indeed, they are not taken into account at all, so much so, that you do not find in any regiment those reading and writing classes which occupy such an important place in most European armies.

On the other hand, you find now in the ranks a considerable proportion of young men belonging to the higher classes, or at least fairly well educated, whose presence is not without considerable effect on the general moral and intellectual level. In any case, the men are generally divided into three classes, or rather in reality into two, the first comprising those of superior education and sure to become before long able to act as instructors. The Captain, as a matter of course, makes the dispositions which appear to him the best. As a general rule, each class is put under an Officer, or if this cannot be, under a non-commissioned officer. In the latter case, an Officer has the general direction of the course of instruction, taking himself charge of the most important branches of it, such as, for instance, everything relating to the theory of rifle shooting and of field duties. It is also the Officer who gives the lessons which specially influence the *morale* of the men, arousing and developing military spirit, together with sentiments of personal honour and self-respect, and it is he who makes them acquainted with the history of the regiment. The remainder of the theoretical instruction is confided to the non-commissioned officers and bears upon the general duties of the soldier, interior economy, issues in kind, duties on guard, cleaning and care of arms, &c. The same nature of instruction is given to each class, and the only difference is in degree, which varies according to the intelligence and previous education of the pupils. The programme of instruction, the hours at which it is given, the time devoted to each branch, the conditions which regulate advancement from one class to another, all these are points left to the Captain, who arranges them as he thinks best. Lastly, before concluding our notice on theoretical instruction, we must mention the existence of a non-commissioned officer's school in every regiment.

Gymnastics and Fencing.

Gymnastic exercises are very carefully attended to throughout the German Army, and there is no branch of instruction upon the importance of which opinion is so unanimous. Gymnastics and fencing, which are really inseparable, are considered by all as the best possible preparation for manœuvres of all kinds, and as the best means of developing in the soldier, not only physical power, quickness, and agility, but also no less useful moral qualities, such as hardihood and energy. It is not, therefore, surprising that the practice of gymnastics should be carried on everywhere with extraordinary zeal and in a systematically progressive manner. Besides which, it is not only in the Army that gymnastic exercises are in honour, they have also taken firm root in the country generally, for in almost all village schools the masters are bound to teach gymnastics, which their scholars continue to practise afterwards as a useful amusement. It is well, however, to remark that there is an essential difference in Germany between civil and military gymnastics. In the Army the so-called Swedish system is in vogue, the characteristics of which are a series of exercises, selected and graduated so as to develop at the same time the different parts of the body to which they impart strength, activity, and vigour. Civil societies, on the contrary, always follow the German system, which consists principally of the skilful execution of more or less difficult feats. This system doubtless develops the powers of the individuals who succeed in the performance of their complicated exercises; but, on the other hand, one cannot help remarking that these gymnasts show an uncommon degree of awkwardness when required to do anything beyond gymnastics. In order to ensure the success of the method adopted, it was, above all, indispensable to take great pains in forming a corps of instructors. This was well understood by the Government, and a special institution was founded at Berlin, under the name of the Central Gymnastic Institute (*Central Turn-Anstalt*) for the promotion of gymnastic professors for the Army, as well as for the State and Communal schools.

There are two courses yearly in the institute; each lasting five months; the winter course from October 1 to March 1, which is attended by 50 Lieutenants of all arms and by 50 civil candidates for the post of professor in public establishments; the second course from March 1 to August 1, which is attended by 100 Officers and 188 non-commissioned officers, the latter, however, only remaining for three months. The institute, therefore, provides the Army annually with 150 Officer instructors and 188 non-commissioned officers, and the Government schools with 50 excellent gymnastic professors. In addition to this, anyone who wishes to become a teacher in a village school is obliged to go through a theoretical and practical examination in gymnastics at the central institute. The instruction given in the institute includes, in addition to gymnastics and fencing, the study of the anatomy of the human body and of its muscles, together with an explanation of the effect produced by each gymnastic movement on the different parts of the frame. The establishment is very well furnished in every way, and is directed by a Captain, assisted by a certain number of Officer instructors (Captains and Lieutenants) and by two civil professors for the instruction of non-military students. We may here call attention to the fact which appears to us extremely interesting, that in every village the schoolmaster is obliged, not only to teach his pupils gymnastic exercises, but also to develop in every way their quickness and suppleness. He therefore trains them to keep step in marching, to align themselves, to perform the more simple motions of the manual exercise only with sticks instead of with guns, to give point, deliver a cut, &c. And during all this instruction the Army words of command are made use of. It is hardly necessary to say that all this pleases the children immensely, and that they pass their holiday time in playing at soldiers. It

is not surprising, after this, that we find the recruits on joining already somewhat smartened up, as we have before remarked, for, thanks to their previous education, these youths are in a way half soldiers. They know how to keep step, to perform gymnastics, and are acquainted with the requirements of a soldier's life, all which considerably lightens the instructor's work.

In each regiment the formation of a body of gymnastic instructors is entrusted to the Officer who has passed through the Central Institute, but thanks to the general diffusion of gymnastic instruction in the Army, Officers charged with this duty have, as a rule, little to do; and it is only when they attain the rank of Captain that they can take advantage of the special instruction which they have received, for, as a matter of course, gymnastics, like every other branch of instruction, come under control and supervision of the Captain. The Lieutenant under whose special charge gymnastic instruction comes is expected to see that the non-commissioned officers adhere strictly to the established order of progression, and that they explain correctly the object of every motion. Lieutenants and non-commissioned officers are also expected to be able to perform all the exercises themselves, but special assistants are sometimes attached to them from amongst the best trained old soldiers. The men of each company are divided according to their proficiency into three classes, for each of which a special course is arranged methodically. Instructors are not allowed to weary the men by a too frequent repetition of the same exercises, but are directed to vary the movements as much as possible, so as to interest the men and to keep them on the alert.

It is found by experience, too, that for this sort of work classes should be small, not more than eight men being placed under an instructor. The strictest discipline is constantly enforced during gymnastic exercises as well as during all other drills. The men have to keep step in marching from one appliance to another, and to dress carefully in line when halted. When a soldier is questioned by a superior he must stand at attention and answer in a loud and clear voice. The number, duration, and hours of the drills are of course fixed by the Captain. We have already noticed the dispositions usually made for recruits. Old soldiers do not have quite so much of it, being generally drilled at gymnastics two or three times a week for an hour each time. It is thought that longer drills would rather do harm than good by tiring the men too much. As for the nature of the exercises they are comprised under the four heads mentioned with reference to the training of recruits :—

1. Extension motions without arms.
2. The same with the rifle.
3. Mechanical exercises.
4. Bayonet fencing, &c.

This last branch of instruction is, as we have seen, given to recruits only in an elementary manner, the men being only taught to go through the motions without arms; but old soldiers practise bayonet fencing as completely as possible, making use of the special arms before alluded to, the bayonet being tipped with a button like a foil. The men are not only taught all the motions of attack and defence but are practised in fencing against one another with these harmless weapons. They are also taught the proper lunges and guards to be used against mounted men. Fencing is always taught individually, except that for a few of the motions it is allowable to form a small squad of men who are already acquainted with the first principles of the drill. We will conclude our remarks upon gymnastic training with a few words upon the method adopted for accustoming soldiers to bear the weight of the knapsack. There is no positive regulation upon this subject, the only rule laid down being that the knapsack must be worn during the summer and autumn manœuvres and also at target practice, its weight being gradually increased.

In winter the knapsack is only worn on guard and at target practice. As a general rule, the men only begin to wear it permanently after the spring drills. Many Officers think it wise not to allow men to wear the knapsack too soon, as they believe that by doing so there is a risk of checking the natural development of their strength and agility. They say that the soldier should at first be free from all bodily restraint so as to get his balance, as it were, and to gain the necessary degree of ease in all his movements. By weighing him down prematurely with the load of his pack you make him awkward and clumsy, heavy and stiff in gait. The importance of this subject is so fully recognised that regimental commanding Officers generally reserve to themselves the power of laying down rules upon it. Sometimes the pack is only worn after a certain period of the year; sometimes its weight is increased by degrees. To arrive at this without spoiling the kit by too frequent packing and unpacking, a soldier's necessaries are only put in the knapsack when absolutely required, their room being usually occupied by bricks or by sandbags made up easily to the weight required.

Inspection of the Recruits.

The period of individual instruction which we have been describing, ends with an inspection of the recruits made by the regimental commanding Officer whose sanction is required for their admission to company drill. This inspection, which takes place in the middle of February in the Guards, and about a fortnight later in the Line, is throughout the German Army one of the most important events in military life, and generally excites a lively degree of interest not only amongst the Officers of each particular regiment, but throughout the garrison. For some days it forms the only subject of military conversation, and you hear nothing but discussions as to the way in which this or that inspection has gone off, as to the results obtained by this or that Captain in following this or that method of instruction. The inspection is conducted with a solemnity calculated to give the recruits a high idea of this, the first test to which they are put by their chiefs. The General commanding the *corps d'armée* usually attends the inspections which take place where he resides, as likewise do all the chief military authorities in the town. Even the Emperor himself is sometimes present. As to the manner in which the inspection is carried on, that depends entirely on the regimental commanding Officer. Every Colonel has naturally his own idea of what is required, but it may fairly be said that all Colonels take the greatest pains about the matter, and that recruits are generally examined one by one in all branches of instruction.

They are presented to the Colonel by the Lieutenant who has had charge of their training, although the Captain is of course mainly responsible. The Lieutenant, however, takes command, and puts the men through the various formations and movements prescribed by his commanding Officer.

The inspection is divided into two parts; one, restricted entirely to evolutions, is the inspection properly so called, and takes place on the day appointed with all the solemnity above noted; the other part is directed to the different specialities such as gymnastics, theoretical instruction, &c., and generally takes place on the following days, as time can be found.

The field Officer's opinion as to the efficiency of the recruits is founded upon the first part of the inspection, after going through which satisfactorily, they pass on the very next day to company drill in order to save loss of time. This is how things are usually managed :—

The recruits of each Company are formed in line three deep. The Colonel passes along the front, making every man in turn perform some motion of the manual exercise. The men are then made to file off one by one, and to march past the Colonel at intervals of eight or ten paces, first in slow time, next in quick time, and lastly at the double.

The squad next moves off by successive files with, in like manner, sufficient distance between them for the inspecting Officer to be able to see them well. This is done as before, in slow, quick, and double time, and with arms either shouldered or sloped.

When it has thus been ascertained that the correct cadence is kept (the regimental Adjutant, an Officer with the rank of Lieutenant, who acts somewhat as the Colonel's aide-de-camp, having assured himself, watch in hand, that the cadence in quick time is up to 112 paces in the minute) the recruits are formed three deep in one section for manual exercise, marching in line, taking ground to a flank directly and by the diagonal march. The section then marches past first by ranks, then altogether to the sound of the drum, and the drill ends by a little skirmishing practice to show that the men understand the different formations in extended order, and know the meaning of the bugle calls. The inspection of the fifty recruits of a company takes about two hours. When all is over the Colonel usually addresses the young soldiers, congratulating them, if there is reason for doing so, and trying to make them realize all the importance of military service, whilst he states his opinion of the proficiency attained by them in the different branches of instruction. Finally, after making his remarks to the Captain and to the Lieutenant instructor, the Colonel dismisses the company and passes on to the next one, which has been meanwhile prepared for his reception, and which has to pass through a similar examination.

The Period of Spring Drills.

After the inspection by the Colonel the young soldiers no longer form a separate class, but take their place in the ranks of the company and share all duties with the old soldiers. Not that their education is supposed to be complete; on the contrary, much has yet to be learnt in many ways, but it is thought that the very share that they are going to take of a soldier's duties, the example of and communication with the old soldiers, together with the varied nature of the instruction given in sping drill, all assist most powerfully to complete their military education. All the men being now available for guard duties, these are much lightened, and each man's turn does not come round, on an average, oftener than every ten or twelve days. The Captain, therefore, has every facility that he can desire for getting all his men together and for practising company drill under the best possible conditions.[1]

The Captain first proceeds to size his company. Every man has his place assigned to him according to his height, and the company is formed into three divisions (züge) two deep, each rank forming a section under a non-commissioned officer. Lance-corporals, orderlies, &c., are equally divided amongst the sections, to each of which, as far as possible, an equal number of recruits is attached. During this period instruction is of a more varied nature

[1] Thanks especially to the custom prevailing throughout the German Army, of telling off separate units for all duties, guards included. Thus, for instance, at Strasburg, whose garrison comprises ten infantry battalions, each in turn furnishes the whole of the men for duty, the other nine battalions remaining complete for instruction, and consequently companies can turn out for duty on an average ninety rank and file, after deducting orderlies, sick, regimental fatigues, &c.—TRANS.

The German Captain is moreover indebted to the battalion organization in four companies for the comparative strength of his command, which gives him the power of imparting such instruction to his Officers and men. A German line battalion musters on the peace establishment 444 privates, including lance-corporals. Being divided only into four companies, each of those has an establishment of 111 privates, including lance-corporals. The Captain would hardly be able to train his company efficiently if it were only one-eighth of the battalion.—L. G.

than during the previous one. Spring drill comprises in fact, as we have seen, company and battalion drill, together with regimental and brigade evolutions, besides which target practice is taken up in earnest. Moreover, it is the time of year when inspections are most frequent, as we shall presently see. It is hardly necessary to mention that the practice of individual exercises, such as gymnastics, fencing, &c., is kept up all the same, being however kept somewhat in the background, and not allowed to interfere with the more advanced training. It is well known how the importance of the company as a tactical unit was established in the last war. [The author is referring to the war of 1870–71.—L.G.]

Recognizing this fact, Prussian Captains have since then redoubled their efforts to give their companies that cohesion and handiness which are now-a-day alike indispensable. Here, again, they have recourse above all to a wisely regulated system of progression. Each Captain draws up a scheme of training by the week, and generally out of his own head. Company drill, properly so called, is usually preceded by some preparatory marches, the object of which is not so much to accustom the men to long distances as to familiarize them with the different rules and precautions to be observed on such occasions.

The march is usually performed in column of sections, with drums and fifes at the head, but without closing up the ranks as at manœuvre. Indeed the distance between the sections soon disappears, and the men learn to march at ease to themselves, and without impeding one another. Advantage is taken of these marches to instruct men by explaining to them the object of this or that regulation, and every opportunity is carefully made use of to point out the evil consequences resulting from a non-observance of these rules. Such examples are easily found when several companies are exercised at the same time as they may very likely meet on the march, interrupt one another's progress, and so forth. Care is taken that they march with a free and lively step, so that there may be a general feeling along the column that they are going ahead. Every now and then the company is called to attention, when the men are taught to keep step and to resume at once a regular formation, each rank closing to its proper distance. At times, too, the company is halted and formed in line, so that the men may judge for themselves how the distances have been kept. When the march is of any length it is broken by halts, arms are piled and some hints are given as to the mode of bivouacking, and a little later on as to precautions against surprise when on actual service. The men turn out for these marches from the very first with arms, helmets, and complete equipment, including havresack and waterbottle, but with empty knapsacks. Afterwards the mess tin is added, and during the last part of the time as the marches become longer, the soldier's burden is also increased by giving him his cloak to carry over the shoulder. Boots are always carefully inspected before starting. Smoking is allowed during the march. When called to attention the men must be steady, but may continue to smoke. These preparatory marches are, by the way, not universally practised in the German Army, there being several army corps in which they are not customary, notably the Guard Corps, in which instruction is carried on more rapidly than in the Line, and to which these marches are less necessary on account of the longish distances which the companies have to go from barracks to the drill ground, thus getting practice in marching. And now begins company drill, properly so-called, which is performed on the drill ground, a level place, or at least considered as such, in the sense that no attention is paid tactically to any accidents of ground which may happen to exist. The object of this drill is to make the men go through, with the utmost precision, the various formations prescribed by regulation. This is what the Germans call "Schul "Exerciren," which may be rendered preparatory or theoretical drill as distinguished from the practical drill or field exercise, which takes place later on, and which teaches how under certain specified circumstances to utilize the

formations before learnt according to the requirements of the situation.[1] One very curious practice is that employed by some Captains during the course of the "Schul Exerciren" of occasionally ordering movements to be executed completely contrary to regulation. This plan is so far good that it keeps men on the alert, accustoms them to get out of a mess, and imbues them with the idea that all words of command, no matter what, are to be obeyed without hesitation. A company thus handled becomes very handy, and quite at the Captain's disposal. The men are unstiffened, so to say, and become convinced that their chief is alone responsible for the orders which he may give, and which it is their business to obey implicitly.

We should also remark that Captains never warn their men beforehand when on the point of ordering any of these irregular movements; on the contrary, all is done on the sudden and so as to take people by surprise. One exercise which is much valued is that of rallying the company quickly in some prescribed formation. First of all, the formation in question is assumed, its object and the name it goes by being explained; the men are then dispersed, and are expected to run in and re-form as before on the Captain's word of command suddenly given. As soon as all prescribed formations are familiar to the men, they are practised in passing from one to another at the double without following the order laid down in the book. The object aimed at is to ensure instantaneous and mechanical execution of the movement without giving any word of command, except the single word indicating the formation. These exercises are sometimes varied by intervals devoted to gymnastics, the men piling arms and hanging their accoutrements on them. All formations and all principles connected with extended order are taught with particular care, and first of all on the drill ground, that is to say without reference to the nature of the country. After the company is thoroughly broken in to all the prescribed formations, and only then, it is allowed to pass on to the application of these formations to the different features of the ground; but, of course, this subject is at present only treated in a preparatory manner, full instruction thereupon being deferred to the period specially devoted to field duties. With what care is company drill conducted! The length of the period devoted to it, five or six weeks, is proof enough of the importance attached to it. At first starting, progress is very gradual, the mechanism and the tactical object of each movement being minutely explained to the soldier. Then, when he is sufficiently familiar with the different formations, these are made to succeed each other as fast as possible, order following order with the utmost rapidity, and everything being done at the double.

Such is the system employed, thanks to which the company becomes as a body wonderfully handy, whilst the individuals composing it are kept constantly on the alert, for often they are not allowed to move more than three or four paces in one formation before having to pass to another. After the company inspections, to which we shall return further on, battalion drill commences, and this is greatly facilitated if the instruction of the companies has

[1] The Germans attach equal importance to these two branches of instruction, which represent, in a way, the means and the end, theory and practice. The time for the latter is of course during the period of field exercises. As for the former, the "Schul Exerciren," although after the late war many military writers recommended its suppression as savouring of pedantry, the new Prussian regulations have retained it as a means not to be dispensed with of maintaining discipline, and of getting men into shape.—TRANS.

There are still, however, (in 1881), many able military writers, who are at the same time practical and experienced Officers and who recommend the omission of many movements and formations now taught to the German soldier, and which they look upon as worse than useless. Such well-known authors, for instance, are Boguslawski, Von Scherff, von Kessel, and the writer of "Die Ausbildung der Kompagnie zum Gefecht."—L. G.

been thorough; so much so that the battalion commander requires no more than three or four weeks to get his command in hand and to make it perform all required of it by regulation. Battalion drill indeed does not usually take place more than three times a week. Each drill lasts about three hours, and, adding the time required in marching to and from the drill-ground, which is often pretty far off, the whole morning is taken up, and a fairly hard morning's work it is too.

The remaining three days are given up to company drill, which it is still thought necessary to continue. Great trouble is taken to correct any weak points in the company which may have been discovered at the inspection. Moreover, target practice is carried on vigorously, and this is done usually during the morning of the days devoted to company drill. In the afternoon of the other days, gymnastics, fencing, aiming, judging distance, &c., are practised. Every effort is made to render the battalion supple, handy, and able to act by itself, thus fitting it to perform its part of principal tactical unit.

As for the details, they are the same as in company drill. Here again we find the school exercises ("Schul Exerciren") intended merely to break the men in to the practice of the prescribed formations; then come the "drills "with a tactical object," in which the real or supposed nature and features of the ground are taken into consideration. Generally also advantage is taken of the march to and from the drill-field to teach what measures of precaution are necessary on the line of march. In some regiments battalion drill is preceded by some evolutions performed by two companies together, so as to accustom the senior Captains to manœuvre a half-battalion. After the battalion inspections, or "presentations," as they are often called, come regimental evolutions, which last from ten days to a fortnight, but take place, if possible, only every other day, so as not to interrupt the other exercises, particularly target practice, which is then carried on with the greatest activity.

The regimental drills, completed as usual by an inspection, are followed by brigade exercises, which last about a week, after which brigades are inspected, and the period of spring drills is succeeded by that of field service. We should mention that the period of spring drills is not nearly so well defined in Line regiments as in the Guards. The former, after finishing company drill about the middle of May, pass on to battalion drill, but commence at the same time instruction in field duties, so that really battalion and regimental drill are carried on together, with various other exercises, throughout the summer. In the autumn brigade exercises are, if possible, performed before beginning the grand manœuvres.[2]

One result of the strong impression which the events of the last war made upon all, is that the instruction of the Army has become, so to say, more realistic than ever. On all occasions and everywhere you see a rehearsal of battle in all its phases.

The memorable day of St. Privat particularly, and the enormous loss suffered by the Prussian infantry in crossing that wide open glacis, under a murderous fire, seem to have mainly contributed to the direction since given to military training. Everywhere, in fact, the problem is being studied of how best to form troops for attack on open ground with the least possible loss to themselves. Each one tries to solve this problem after his own fashion, and the variety of resolutions proposed, together with the discussions to which the question gives rise, excite everywhere the deepest interest. I have known some Colonels give up drill on level ground altogether, and endeavour

[2] That is to say, as far as circumstances will permit. It will be easily understood, that Line regiments, disposed as they are in a number of large or small garrisons, are far from being as well situated in many ways for drill purposes as the Guards, who are almost entirely concentrated at Berlin or at Potsdam.—TRANS.

to arrive at the utmost possible regularity of formation and precision of movement on very broken ground. This is no easy matter, particularly when you wish at the same time only to perform movements tactically appropriate to the nature of the ground. This result is doubtless much less easy to attain than it is to arrive at that really ideal perfection presented by most regiments when manœuvring on level and open ground. This expression, "ideal perfection," is not too strong. I have seen regiments, when "pre-"sented," *i.e.*, when inspected by the General commanding the army corps (sometimes even by the Emperor) perform the whole series of exercises with such absolute regularity, with so pedantic a precision, that only an eye-witness can form any conception of it. But the most curious part of the business is that regiments accustomed to drill on broken ground are, as a rule, far superior to the others, the precision of their movements exceeding everything that one can imagine, which, after all, only proves that manœuvring on a parade is an easy matter for troops accustomed to preserve order and regularity on broken ground. Having given this sketch of the exercises carried on during the period of spring drills, we will endeavour to give an idea of their general effect and of their characteristic points. We have first to notice the precision and scrupulous strictness with which words of command are obeyed. Next, the perfect silence and steadiness which cannot fail to impress the spectator most favourably. The men are taught to dress themselves at the word "halt," and do so with the most perfect rapidity and accuracy. After the word "attention" has been given there is not a move. You never observe an Officer, no matter what his rank be, give way to excitement, show loss of temper, or give loud rebukes. All such manifestations are strictly forbidden, so much so, that Officers who have given way to them have ere now been dismissed. Not a sound is to be heard while troops are drilling, except words of command, which are always given in a very sharp and decided tone. In case of any mistake, the instructor stops the movement, goes up to the Officer who has gone wrong and quietly explains what he should have done. Many instructors, however, prefer waiting to the end of the drill, and then pointing out any mistakes which have been made to the whole body of Officers assembled for the purpose. This is done when making the "critique" on the proceedings, an unfailing conclusion to all military exercises. Even in presence of the Sovereign everything goes off just as usual. Aides-de-camp and orderly Officers are only put in movement under very exceptional circumstances; indeed, hardly any are to be seen about. It is the rule at all drills never to repeat an order. He who gives one waits patiently for its execution, and if any subordinate hesitates or makes a mistake he is corrected, as we have remarked, when the final critique is made, but the greatest importance is attached to giving all Officers the opportunity, and, at the same time, to making them consider themselves bound to reflect and to determine for themselves how to carry out any given order.

The end which is constantly and steadily kept in view in the German Army, is the creation and development of individual initiative in all ranks.

Hear how one of the highest authorities in that Army expressed ideas which have taken root amongst all its members. "Although we have a perfect "right to make observations to our subordinates at any moment, we abstain "from doing so on principle, even when we hear them expressing in their "critiques opinions which we do not ourselves hold. Everyone does not see "things after the same fashion, and we hold that before judging of a system "one should wait to see to what it leads. When the time comes for our "inspection we can make known our requirements and state our opinions. "What we aim at, above all, is to develop in our Officers initiative and love "for the profession, and we think that the best mode of arriving at this is "to leave them full and entire liberty in the choice to be followed in attain-"ing the end which we have pointed out. At the same time, by listening to

"their critiques, we obtain reliable evidence as to their value as Officers."[1] Such are the ideas and principles in vigour throughout the German Army, principles, moreover, which people are not contented with laying down in theory, but to which they conform strictly in practice. It is really a pleasant sight to witness the perfect coolness and ease with which, under circumstances such as above described, young Officers explain their ideas before superiors, without being in the least put out by their presence, no matter how high their rank. I will cite an instance which came under my own observation, and which will give a fair idea of how such matters are conducted.

A Major is drilling his battalion when he sees a General coming towards him. He immediately halts his men, gives the word "Attention," and approaching his superior, says, "General, —— battalion of —— regiment is "performing battalion drill." "Go on," says the General. The Major returns to his men, and continues his task without taking any further notice of the General, who walks about as a mere spectator. At the end of the drill, the Major assembles his Officers around him as usual, and begins his critique, commenting at length upon all that has been done, and awarding to each his share of praise or blame. The General meanwhile draws near and listens. The Major, without seeming in the least embarrassed by the presence of his superior, finishes what he has to say, then turns towards him and says, "General, the drill is over, will you permit me to dismiss the bat- "talion?" The General gives a sign of assent. The Major salutes. The battalion marches off to its barracks, whilst the General goes away without making any remark, to another part of the ground, where a similar scene is enacted. We must not omit to remark, that a system such as described, besides powerfully developing individual initiative, has also the great merit of obliging Officers of all ranks to be acquainted with their profession, even down to its minutest details, to work out thoroughly their plan of instruction, and to weigh carefully every word of their critique. Another striking feature of German military exercises is the remarkable quickness with which all movements are performed, imparting great animation to the whole proceeding. All formations of line or column on the march are performed at the double, and amidst a confusion which is only apparent, and which ceases as soon as the movement is completed, when everyone at once resumes the regular pace, marking it strongly. But order is no sooner re-established, than the instructor gives another word of command, and indeed, he seems to do his best to make one word succeed another without end, only leaving between them just sufficient time for their execution. This way of carrying on is certainly fatiguing to the men, but it imparts fresh interest to the drill, the attention of all is kept awake, and everyone, both Officers and men, attain a pliability and quickness, both of mind and body, which are perfectly marvellous. In the "Schul Exerciren," as we have before remarked, everyone is bound to conform strictly to the drill regulations. Indeed, this is, in the eyes of the Germans, their only practical advantage, as they are only looked upon as means, perfectly indispensable, however, for promoting handiness and discipline, and on that account solely a number of things have been kept up which are unanimously considered useless or inapplicable to war, such as three-deep formations, squares, relief of a line of skirmishers, its advance and retreat in échelon, &c. All these movements have to be executed with the most rigid correctness on the drill ground, upon the principle that you must exact *the more* in peace time, so as to ensure *the*

[1] This passage is in thorough keeping with the interesting remarks contained in a letter from an eminent German General to Colonel Lonsdale Hale, and quoted by him in his lecture on "Outposts," delivered at the Royal United Service Institution on March 25th, 1881.—L. G.

less in war, and the most direct and the most valuable result of this training is to discipline the men, and to get them well in hand.

The following is an abstract of the opinion which I have heard professed on this subject by the majority of Prussian Officers: "All drill formations fixed "by regulation are the objects of our careful study, and are deemed by us of "the utmost importance. Our soldiers only serve three years; none of them "have seen any service in the field, and consequently they cannot judge for "themselves of the greater or smaller utility of the movements which they "may be ordered to execute. We do not see any objection to their being "allowed to suppose that all these movements are to be performed in the "same manner under fire. They will only be the more attentive to the voice "of their leader, only the better in hand. If we were, on the contrary, to make "too light of regulations, the men would soon take it into their heads that "there are no fixed rules in war, and that everything is modified according "to circumstances; they would break loose from us. In the same manner "as you know the individual soldier to be well disciplined by the way in "which he understands his duty and the principles of military honour, so you "can tell whether a body of troops is in good order and well in hand by its "knowledge and performance of its drill. Drill regulations are the touch-"stone of discipline, and many of them are only important on that account. "All good Officers view the matter in this light, and such being the case, it is "not necessary to trouble ourselves about any imperfections which may "exist in our drill book. We feel certain that, when need be, its teaching "will always be applied intelligently." As for the measures which should be pursued in time of peace to ensure what is called "fire discipline" in war, that is to say, to ensure for the commander complete control over the fire of his men, no one has been able to give me a positive answer. The general opinion seems to be, that the Officer who can keep his men in hand in other respects will, up to a certain point, be able to do so likewise in this matter. No fixed rules have ever been given out upon this subject, and no one thinks of laying down any. "Fire discipline" is looked upon by all as only a branch of general discipline, and to be attainable by the same means, that is, by the whole system of military education in peace time, the constant object of which should be to make the soldier everywhere, and under all circumstances, obedient to the voice of his immediate leader, attentive to his orders, and confiding fully upon him. All the efforts of an Officer should be directed to gain this moral ascendency over his men; thus only will he succeed in controlling their fire *to a great extent*.

We italicise these last works because all Prussian Officers are fully agreed that there are certain critical moments in action when excitement is so great, emotion so strong, that it is not in the power of every man to preserve the coolness necessary for calm attention to orders. Even at peace manœuvres we frequently see soldiers during heavy firing mistake some noise or other for a word of command. How much more of this must happen amidst the tumultuous scenes of actual battle, and though great stress is laid in peace time on the methodical execution of volley firing, no one believes in the possibility of the same being carried out in war.[1] During the whole of the late war (1870–71) only one solitary example is cited. A Captain takes credit to himself for having been able to make his company fire a volley on some French cavalry at the Battle of Sedan, and even this exceptional volley was, by the Captain's own

[1] Since this passage was written, there has been a considerable change of opinion on the Continent generally, and in Germany in particular, as to the applicability of volley firing in war. It is now thought that there are many situations in battle in which volleys are more likely to be effective than any other sort of firing. See on this subject the "Schiess-Instruktion für die Infanterie" (1877), and the paper on the "Tactics of Infantry in Battle," in the last number of this Journal.—L. G.

admission, by no means a clean one, and soon degenerated into rapid independent fire. Before concluding our reflections on this subject, we think it well to make a few remarks on the Prussian Infantry Field Exercise Book, published in 1876, which, both in its general character and in its details, is an admirable interpretation of the ideas now prevalent in the Prussian Army. The book consists of two perfectly distinct parts; the first, treating merely of drill regulations, is obligatory for all. It describes all the movements to be practised, points out the post which every one has to occupy in the different formations, and gives the various words of command. The second portion, called the tactical part, confines itself to recommendations and to indications as to the use to which the formations prescribed in the first part may be put.

The first part contains whatever relates to individual drill and to close order formations in company, battalion, and brigade, in short, everything connected with the so-called "Schul Exerciren." It is thus only a methodical treatise on preparatory drill and discipline, and for this reason one which must be carried out to the letter.

The utmost possible condensation has certainly been arrived at, for the small volume containing the whole "Règlement," is complete in 226 pages, large type, yet comprises everything relating to individual drill, to company, battalion, and brigade exercises, all rules respecting parades and the honours paid to the colours, bugle sounds, and lastly the tactical portion. One remarkable point is the absence of explanatory plates, there being only two in the whole book, one illustrating the formation of a square, the other the formation of a regimental column on parade, both of which formations would from their complication be difficult to explain by a mere description. All other formations are so simple and so well known that nothing beyond the text is considered necessary to make the details comprehensible, or to recall them to the memory should they chance to be forgotten. Moreover, all diagrams have been omitted on principle in the tactical part of the work, because it was thought desirable to avoid checking in any way individual initiative and the independence which all Officers are wished to exercise when applying drill formations to the exigencies of actual service in the field. The compilers of the work feared that had they given any diagrams to illustrate their recommendations, these might have been considered models which were perforce to be copied, and that, in consequence, the intellectual labour and reflection by which each Officer should arrive at forming an opinion for himself would be discouraged. This is a proof of how far that same individual initiative, which is looked upon by the Prussians as one of the great sources of their power in war, is expressly sanctioned by their Field Exercise Book. Such a development of initiative, and the almost total absence of diagrams, in the chapters devoted to drill might naturally be expected to produce a certain want of uniformity between regiments in their mode of executing the prescribed movements; but such is not the case; on the contrary, all the different formations have been so thoroughly instilled into Officers that you can hardly remark the slightest difference between regiments in this respect.[1]

This is why diagrams are not required to explain formations well known to all, and to which the Army has long been accustomed. It is worthy of notice that the Field Exercise Book contains no special article on regimental drill, which is doubtless considered simply as intermediate between that of the battalion and brigade. As for the evolutions of a whole division, they are not practised in Prussia because the possibility of a whole division being brought

[1] The "Lehr-Infanterie-Bataillon" (Battalion of Instruction) at Potsdam doubtless contributes to this result, a certain number of Officers, non-commissioned officers, and privates, taken from all infantry regiments in the Service being attached to it annually for six months, for the avowed purpose of ensuring uniformity of drill.—L. G.

into line without keeping one of its brigades in reserve is not admitted. It is thought better to make the two brigades manœuvre separately than to keep one of them constantly inactive. I cannot conclude this chapter better than by quoting a remark made in my presence one day by a regimental Officer: "To command a company efficiently it is sufficient to be a good soldier and "know one's drill thoroughly, but the commander of a battalion should be well "grounded in tactics."

Inspections.

As most of the inspections, and these the most important, belong to the period of spring drills, this seems to be the place to say a few words upon this subject. We will first give a list of these inspections, then proceed to examine the manner in which they are conducted, and endeavour to point out their chief characteristics and their most interesting features.

Between the day on which the recruits are embodied and that on which the men who pass into the reserve at the end of their third year are dismissed, the following is the series of inspections which the Prussian soldier has to undergo.[1]

January. That is before the inspection of recruits which we have already described.

1. Inspection of the old soldiers in individual, theoretical, and gymnastic instruction, including bayonet fencing. Each company separately by the regimental commanding Officer.

February.

2. Inspection of recruits which has been already described. In the Line this is generally deferred to the beginning of March.

3. Inspection of the *personnel* of the hospital department by the regimental commanding Officer.[2]

March.

4. Examination of non-commissioned officers and of re-engaged men who are attending the regimental school by the regimental commanding Officer.

5. Inspection of the separate companies by the regimental commanding Officer. In the line this takes place in May.

April.

6. Battalion inspections by the Brigadiers or Generals of Division. In the Line these take place in June.

May.

7. Regimental inspections: in the Guards by the Emperor, and in the Line by the Generals commanding army corps, some time in the course of the summer.

8. Examination of the companies in gymnastics and theoretical instruction by the regimental commanding Officer.

9. General review by the Emperor of all the Guard regiments present in Berlin. Line regiments have no parade of this sort.

June.

10. At the end of the month, inspection of target practice by Brigadiers; in the Line by regimental commanding Officers.

July.

11. At the beginning of the month, examination of the companies in field service by regimental commanding Officers.

August.

12. Examination in gymnastics by regimental commanding Officers.

[1] The dates given below apply to the Guards, whose instruction is, as we have seen, carried on more regularly than in the Line. When necessary, the corresponding time for the particular inspection in Line regiments is specially noted.—TRANS.

[2] No doubt, the stretcher men attached to each company, who receive special instruction in peace time.—TRANS.

September. Before the commencement of the grand manœuvres and generally at the place of assembly.

13. General review of all the troops assembled, only held as a matter of course, however, if the Emperor attends in person. In other cases it is left to the commanders of army corps to have the review or not, as they think best.

October. At the end of the month.

14. Inspection of the regimental detachment of pioneers by the regimental commanding Officer.

We may add to all these a minute inspection of the *matériel* in possession of regiments, which is made every three or four years by the Brigadier, and an inspection of arms which only takes place every ten or twelve years, and is made by a Field Officer selected by the Minister of War. Two things specially strike the observer as to the manner in which all these inspections are conducted; first, the excessive care with which the independence of each Officer within his own sphere of action is maintained under all circumstances; secondly, the precautions constantly taken to deprive the men as little as possible of the time devoted to their instruction, whilst giving every Officer full opportunities for ascertaining the exact condition in every respect of the troops under his command.

These two conditions may appear, at first sight, incompatible and contradictory, but experience shows that this is not the case, and that they may in fact be brought into harmony by observing the following rules to which the whole German Army now conforms:—

1. Never to make the same body of troops go twice through the same sort of inspection in the year. Two Officers, one of whom is subordinate to the other, may make separate inspections of the same body of troops, but never of a similar nature.

2. Instead of devoting a special occasion for an inspection, to take advantage, as far as possible, of the occasions on which the men are being instructed in the branch which is to be the special subject of inspection; and even, if need be, to be satisfied with the appearance of only a portion of the men at the inspection, those men being selected the interruption of whose training will be of the least consequence.

It is by adhering strictly to these principles that the higher authorities have been able to keep themselves thoroughly acquainted with the condition of the troops, whilst making as few inspections as possible so as not to interfere with the course of instruction. A few examples will suffice to show how the conditions above noticed are attained. It may be remarked that from the list above given examination in gymnastics, individual drill, and theoretical instruction, is repeated several times in the year. This shows the importance attached in the German Army to the physical and intellectual development of the soldier. On the other hand, it should be noticed that these numerous inspections are made by the regimental commanding Officer, that is to say, by one who has every facility for choosing his opportunities so as not to interfere with the progress of the training, and this is a principle to which all Colonels rigidly adhere, taking care to choose a time when one of the companies is going through a certain kind of drill for examining it in that particular subject. Thus, for example, the Colonel knows that to-morrow No. 3 Company will be at gymnastics and No. 7 at theoretical instruction; he gives out accordingly in orders, adhering as far as possible to the hours fixed by the Captains, that he will on the following day examine No. 3 in gymnastics and No. 7 in theoretical instruction, the only difference between the Colonel's inspection and the regular daily instruction being, that in the former case the Captain turns out his company as strong as possible, including orderlies, and in review order, handing to the Colonel his effective state. Inspections of this kind are never made by any Officer except the regimental commander.

If two Officers have to put a body of troops through the same sort of inspection, this is how they manage to avoid exposing the men to go twice through the same ordeal. In June, which is the season for the battalion inspections, the divisional General orders his Brigadiers to inspect the second battalions of their regiments, reserving the first and third for himself, or inversely, and the divisional General never inspects a battalion which has been seen by the Brigadier. The same rule is observed with regard to the inspection of more considerable tactical bodies. Thus in the Guards, the regiments and brigades of which are "presented" to the Emperor himself, no other Officer inspects a regiment or brigade, but as all the superior Officers attend the Emperor's inspection, each of them has an opportunity of judging of the efficiency of his command. It may perhaps be imagined that a divisional General who has only inspected the second battalion of a regiment will hardly be able to form an opinion as to the efficiency of the other battalions, but this is not the case, he knows them just as well as he knows the first battalion, having attended their inspection by the Brigadier whose final critical remarks he has listened to. Perhaps he may even here remark some point which escaped the Brigadier's notice.[1]

Even Officers of the highest rank take good care never to disturb the regular course of instruction, taking advantage, as they do, for their inspection of a day when a regiment is assembled on its parade ground.

The Emperor, of course, cannot always conform to this rule, but at all events he chooses a time for his inspection within the period devoted to the particular subject. This is how they manage in the Guards. The Chief of the Staff, after having come to an understanding with the Colonels, Brigadiers, &c., draws up a list of all inspections to be made by the Emperor, assigning to each corps the day least likely to interfere with its training. The programme is then submitted to His Majesty for approval, after which it is lithographed and distributed so that everyone interested in the matter may attend the inspection. The same practice is followed with regard to all inspections of divisions, brigades and regiments, by their respective commanders.

Notice thereof is sent to the Staff Officer of the army corps, who makes out a general list which he communicates to the Emperor and to all the garrison of Berlin, and the environs, so that all Officers wishing to do so may attend the inspection, and a great many take advantage of this opportunity. The Emperor himself often comes to inspections made by regimental commanding Officers, and as a rule General Officers go to inspections made by their subordinates. On all occasions there is a recurrence of the scene already described; the high and exalted personages only come as spectators, though very attentive ones, of the inspections which they take care not to disturb, standing most of the time apart, but always approaching to hear the final critique. Thus the principle of individual independence is maintained, whilst at the same time the power of expressing their ideas in public is developed in all Officers and everyone is the gainer, for besides profiting by his own observations each one may take advantage of those of others.

All bodies of troops up to the regiment inclusive are deployed in line when formed for inspection. Brigades are generally formed in column, in reserve formation. In all cases the inspecting Officer is the only one who passes along the front; neither his superiors, if any be present, nor his subordinates though waiting for him on the ground, inspect the troops either before or after him. Even at inspections made by the Emperor, no one goes down the line before His Majesty. This is an excellent rule, for it admits of troops not being brought to the ground till the last moment. The same rules are observed with regard to honours paid by troops. Arms are only presented

[1] The General of Division thus manages to inspect at one and the same time both his battalions and the Brigadier.—TRANS.

to the inspecting Officer ; to all others, no matter of how high rank, the only compliments are the words of command, " Attention,"—" Shoulder arms."

The official state is presented to the inspecting Officer alone, but as the Emperor or some General Officers may attend, battalion and regimental Adjutants usually have some copies in reserve.

If an Officer of higher rank than the inspecting Officer happens to pass during the inspection, the latter gives the word " Attention," and, leaving the troops, approaches the superior, to whom he reports that he is making such and such an inspection of such and such a corps, after which, having received permission to go on, he proceeds with his work without troubling himself further about his superior. Having finished his inspection, he assembles the Officers and makes his critique, which his superiors come and listen to, and when he has finished, asks permission to dismiss the troops. Such is the general course of an inspection, a course which is in no way affected by the presence of any spectator, no matter who he may be. Everything is conducted according to ordinary routine in a calm and quiet manner, without any signs of excitement. When an Officer is going to make an inspection he only makes known the programme thereof to those concerned the day before, a wise proceeding, as tending to prevent any special previous preparation.

An inspection once ordered is only countermanded under very exceptional circumstances. The Emperor himself conforms to this rule so strictly that if prevented from making an inspection he delegates the duty to the General commanding the army corps, who afterwards reports to him upon the condition of the troops. The Sovereign never puts off inspections, because the disturbance which would thus be created in the general programme would interfere with regular progress. At company inspections by the regimental commanding Officer the men always turn out in the suit of clothes which the inspecting Officer wishes to see ; generally in No. 1 suit, because he has had occasion to see the others frequently during the winter, but for General Officers' inspections No. 2 or No. 3 suits are usually worn according to the weather, to which great attention is paid. The higher authorities give an example of strict economy in this respect, and endeavour to save the soldiers' clothing on all occasions as much as possible. It is not an uncommon occurrence for a General to telegraph to a regiment the order to turn out in old clothing on the very morning of the intended inspection for fear of damage to the new clothing by bad weather. With such precautions it is not surprising that the troops should always turn out as well as they do. By way of saving the bayonets they are never fixed at drill, inspections, parades, nor on guard. It is thought well, too, to make the men understand that they should never fire with the sword-bayonet fixed, as its weight spoils the aim, and it is itself liable to injury from the powder gas. The bayonet is therefore only fixed by sentries on certain posts at night, or for marching past, forming square, and charging, and then only when manœuvring before the Emperor. At all ordinary drills or inspections when the word of command " Fix bayonets " is given, the men only go through the motion of doing so. All inspections, and indeed most drills, commence with marching past, because it is thought that troops march past in better form when fresh. To march past well is considered the most trying of all manœuvres, and therefore an infallible criterion of efficiency. No points are ever placed for marching past ; this proceeding is looked upon as superfluous, and the guides on the pivot flank are expected to regulate the march without any such extraneous aid. Even at grand parades in presence of the Emperor this principle is acted up to, and the only points given are by two orderly Officers who are placed on the saluting base to the right and left of the Sovereign.

Although a certain number of drill movements are performed at all inspections to give evidence of the pliability and handiness of the body of troops re-

viewed, yet no great amount of time is spent in this way, and they soon go on to work out some tactical problem which the inspecting Officer sets on the spur of the moment. By proceeding in this manner the latter can gauge at the same time the instruction of the men and the intelligence of their chief; he can find out how far both this Officer and his subordinates are capable of coming to a resolution, and of acting upon it when required. Thus, for instance, during the inspection of a battalion, after the march past, some movements in line and some column formations, a Brigadier set a commanding Officer the following problem :—"Your battalion is marching in column of route by "itself, and without connection with other troops. Having reached a certain "point, you learn that a certain position on your line of advance is occupied "by the enemy, whom you decide upon attacking so as to be able to pursue "your way."

The commanding Officer at once formed his battalion into column of route, detaching an advanced guard, a rear guard, and flanking parties, and marking where the head of the column is to rest. He then galloped forward to his advanced guard to reconnoitre the enemy represented by the regimental bandsmen whom the Adjutant has posted. He next made all his dispositions for a frontal attack, and also for acting on the enemy's left flank, as the ground favoured this movement. All orders and explanations were given in the hearing of the inspecting Officer, who made no remarks at the time, reserving any observations for the final critique. Before finishing this chapter on inspections, it may not be out of place to say a few words on reviews. These are not looked upon as inspections, because they give no opportunity for judging of the degree of instruction of the troops, but are rather treated as military displays, and as they take up a great deal of the time required for instruction they are avoided as much as possible. The Guards have, as already noted, only one grand review annually at the end of the spring drills. One takes place also at the commencement of the grand manœuvres at the place of general rendezvous, but only when the Emperor attends in person, otherwise most of the corps commanders dispense with such shows.

On the same principle, that is to avoid interference with the course of instruction, the only corps required to attend the grand review at Berlin are those actually quartered in the capital. Regiments stationed in the neighbourhood, although belonging to the Guard and to the brigades and divisions which take part in the review, do not leave their quarters. It is thought unadvisable to take them away from their work for a time which would be much longer than for regiments quartered in Berlin. The only exception is in the case of the two regiments stationed at Spandau, but this is only because they are actually at that time of the year in Berlin, to which place they come for a few weeks to perform some of the spring drills with the regiments of their respective brigades. The day before the review a Staff Officer is sent to prepare the ground by placing posts to mark the right flank of each regiment and battalion. This done, all passes off on the following day with an absence of fuss and an amount of quietness which are remarkable.

On the particular occasion in question, 11 o'clock having been named as the hour for parade, the markers appeared on the ground at 10 o'clock; one for each battalion, battery, and cavalry regiment. These markers are the same men who had on the previous day placed the points under superintendence of the Staff Officer, who soon after came up himself. At his signal the markers took post and aligned themselves. The Officer dressed them and in less than half-an-hour all was ready. At 10.30 the first regiment marched up, and by 10.45 the last on the ground had deployed into line. At 10.40 the Generals in command appeared, and soon after those who attended as spectators; at 11 precisely the Emperor arrived accompanied by the King of Sweden. No one went down the line before the Sovereign, who moved along it at a walk, according to the usual practice in Germany, so as to form a better opinion of the regularity

of the formation, and although the troops had not appeared on the ground more than half an hour before, nothing could exceed the precision of the alignment. Every care is taken to prevent troops being brought upon the ground too soon, to the waste of valuable time, and there have been instances of severe reprimands administered to commanding Officers for not attending to this rule.

Battalion commanders are required to align their battalions quickly on the others, which is simple enough, because the right flank of each has been already marked out. If any battalion is not correctly aligned, its commanding Officer is alone held responsible, and, thanks to this, each corps takes up its position with perfect regularity and without any extraneous aid.

Nothing is more striking than the quiet and order which prevailed both at the assembly of the troops and throughout the parade. All Staff Officers of the *corps d'armée* attended quietly as spectators in rear of their General, who did not find it necessary to give a single order from beginning to end.

A lithographed plan, showing the position to be taken up by the different corps and by unattached Officers, had been distributed beforehand to commanding Officers. From this everyone knew exactly what he had to do. Always, be it remarked, the same principle, so characteristic of the German Army, of complete independence, and, at the same time, entire responsibility left to each and everyone within the limits of his own sphere of action.

We must now say a few words of the detailed inspection which takes place every three or four years at the beginning of summer. This is simply an inspection of *matériel*, and has nothing to do with examinations or drill. An order is issued generally beforehand to explain how the inspection is to be carried out. The inspecting General is assisted by a Commissariat Officer, and by a master armourer in matters having reference to their special functions. These inspections usually take a long time, and regiments prepare for them a year or more beforehand. The inspecting Officer is bound to examine the whole *matériel* both for the peace and war establishment, and this not in an offhand way, but article by article and button by button.

The inspection, however, only concerns objects shown in the regimental clothing roll. Whatever effects the corps has managed in any manner to acquire by its own economies are its own private property, and are exempt from inspection. Thus, for example, according to regulation, every infantry regiment must have what is called a complete *war suit*, that is to say, the clothing and equipment required for 7½ battalions, all fit for immediate use, and besides this only one *peace suit*. All the things above mentioned are subject to inspection. But no inspector has to trouble himself with Nos. 3, 4, 5, or 6 (if there be a sixth, as there is sometimes) because the corps is not obliged to keep them up, and if they exist it is only thanks to regimental management. These suits are the private property of the companies.

The inspection of arms only takes place once in ten or twelve years. It deals with the arms and their belongings, and is conducted by a field Officer, specially assisted by the Minister of War, assisted by a "controller of arms." The Minister designates annually the corps which are to be inspected.

Period of Field Service.

After brigade exercises for the Guards, and after battalion exercises for the Line, comes one of the most important periods of the whole course of instruction, that of field service. Having left Germany during the summer months, I was unfortunately unable to go through with it, but what I witnessed during the few days that I was able to spare for accompanying the troops at their field exercise, was sufficient to convince me of the importance attached to everything done at this period.[1] The Germans understand by the

[1] No better examples can be given of the earnestness and thoroughness with which Prussian Officers devote themselves to the instruction of their men in field duties,

expression "field service," not only reconnaissance and other measures to guard against surprise, but everything relating to the employment of troops on the battle-field. For instance, the adaptation of the movements of a body of troops or of isolated individuals to the nature of the ground; marches with all the precautions employed in war; minor tactics; the attack and defence of localities; and the mode of overcoming any obstacles which may present themselves; the arrangements both external and internal of a bivouac and the mode of guarding it from attack; outposts and field intrenchments. In addition to all this, musketry instruction is carried on actively during this period and the men are taught to swim. Lastly, to prevent any looseness and unsteadiness from being produced by this sort of work, regular manœuvres are continued throughout this period, together with individual drill and guard duty according to the requirements of the garrison.

As usual, great care is taken to carry on the training in a systematically progressive manner; the instructors endeavour to combine at each drill different exercises bearing some sort of analogy to one another, a mode of procedure which keeps up the attention and zeal of the men, and makes the instruction much more interesting to them, in consequence of the variety of the subjects dealt with. Up to the beginning or middle of June, all these exercises are carried on by companies which are about this time inspected by the regimental commanding Officers, after which the same exercises are repeated on a larger scale, that is to say, by battalions, and even by entire regiments in combination with detachments of the other arms. The method of fighting which circumstances render necessary now-a-days, and the experience of the late war have made it indispensable for commanders of the smallest bodies, from the company down to patrols and advanced posts inclusive, to possess to the utmost extent the spirit of initiative and the power of extricating themselves from difficulties. On this account the greater part of the summer is left at the entire disposal of the Captains, for it is only during the second half of this period that larger bodies of troops are brought together for this branch of instruction, so as to give their commanders also the opportunity of learning their work. By this means too all have an opportunity of remarking how rules are modified as the numbers employed are increased, and as the theatre of operations becomes more extended. During the last part of the period the drills are often very long, so much so that regiments are out for twenty-four hours and sometimes longer.

We will now examine the rules which regulate all these exercises, as far at least as I have arrived at making myself acquainted with them by questioning and conversing with experienced soldiers.

1. *Advanced Posts and Patrols.*—Although this branch of military duty is more especially within the province of cavalry, it is nevertheless the object of serious attention on the part of infantry. Before sending a company into the country, it is customary to begin by some outpost drill in the neighbourhood of the barracks on a level, open plain, so as to show clearly to everyone, especially to the young soldiers, the object to be attained, and the general dispositions to be made. The company is divided into

and in preparation for war generally, than are to be found in two works which have appeared of late years in Germany, and which having been translated into English, are, it is to be hoped, known to most readers of this Journal:—

1. "Extracts from an Infantry Captain's Journal," by Major (now Colonel) v. Arnim. The translation by Major (now Colonel) East, A.Q.M.G., was published in No. 89, vol. xxi of the Journal of the Royal United Service Institution.

2. "Tactical Examples," by Major Hugo Helvig, translated by Colonel Sir Lumley Graham, and published by Messrs. C. Kegan Paul and Co.—L. G.

two portions, or else one company is opposed to another at a certain distance from it, after the commanders have come to a mutual understanding. By this means, soldiers see at once how the outposts are placed on both sides, and come to understand that they must not only guard the position of the army to which they belong, but also watch all the movements of their adversaries. During the course of the drills, Officers and non-commissioned officers explain to the men what they have to do, and how they must regulate their dispositions upon those of the enemy.

When everyone, particularly the younger soldiers, have been thoroughly imbued with the general principles, the company is taken into the country, and then it enlarges little by little the sphere of its operations, until the full extent which this would have on actual service is attained.

It is always a rule to have a "marked enemy," whenever this can be managed. Thus, when the drill is over, one company makes its way home, endeavouring to conceal its line of march as it does so, whilst another company follows, trying not to lose sight of it, the Captains having arranged matters with one another beforehand, so as to be able, they and their subalterns, to give all their attention to the instruction of their men, and to give them every necessary explanation, whilst checking the reports of sentries and patrols.

Great importance is attached to the truth of these reports. Pains are taken to impress upon every soldier's mind the necessity of carefully distinguishing between what he has clearly seen himself, and what he has only half seen or suspected, and instructors require that in all respects, well ascertained facts should first be stated, and afterwards inferences, together with the grounds which gave rise to them.

Besides awarding punishment to the author of an inexact report, or of a pure invention, the instructor does not fail to point out, in such a manner as to come home to all, the consequences which similar flightiness might produce in war.

Whilst upon this subject, we may as well notice, that at all manœuvres and exercises in the field, envelopes of the same uniform pattern, and little pocket books, upon every leaf of which are printed all necessary headings, are used throughout the Prussian Army for reports. These envelopes and pocket books are prepared in large numbers at the secret State printing press, at Berlin, so that at any moment an abundant supply of them may be issued to the Army. The address, as well as the hour of dispatch and of receipt are noted on the envelope, and also the pace at which the bearer is to proceed, the mark X indicating the walk; XX the trot; XXX the gallop. The horseman being obliged to adhere strictly to the pace noted, is prevented from fatiguing his animal unnecessarily, and it is the business of the sender to give the speed at which the bearer is to travel, according to the importance and urgency of the despatch. Reports and addresses were always written in pencil.

I think it well to remark what a practical idea this is of a uniform pattern of report to be used throughout the Service, and which has become so familiar to all, that every soldier understands its use thoroughly, as well as the rules to be observed in the transmission of orders and reports. The preservation of these reports too, in the diaries of marches, and in the archives, is much facilitated by their identity in point of size.

Every Officer and non-commissioned officer who has been charged with a separate command during these exercises is required to produce on his return a sketch taken on the spot, together with a brief account of what he has done, and a report on the mission with which he was charged.

When the instruction of the companies is complete, the same exercises are carried on by battalions, then by regiments, each unit occupying the whole space which it would really have to cover with its war establishment, taking into consideration the particular nature of the ground. During these manœuvres, which sometimes are of long duration, all Officers are entrusted

with independent missions, of which they afterwards render an account, as we have seen above.

2. Advantage is always taken of the passage from barracks to the drill-ground and back to accustom the men to the rules to be observed on the line of march, and to the measures of security to be taken on such occasions. Here again they begin by the company, passing on afterwards to the movements of the larger bodies. Often two companies or two battalions move out by different roads and try throughout the march either to keep up their communication or, on the contrary, to watch one another's motions. In all cases the object aimed at is to give some special task to as many men as possible, and the explanations as to what they are to do, as also the critique of their acts and of their reports are always given in the presence of all the others, so that all may have the means of knowing what is being done and how everything should be done.

3. These two kinds of exercises are naturally connected with instruction on the mode of organizing and of guarding a bivouac, which is commenced with the company, but only receives its full development at the rather long manœuvres performed by the larger bodies. The rules for the arrangement of a bivouac are taught, vedettes and other sentries are posted, sites for the cooking-places are fixed upon, and sometimes even all cooking materials are taken out with the troops. The men are then required to make ovens, under the direction of their Officers and non-commissioned officers, who also point out to them on occasion how to have recourse to different arrangements from those commonly in use, so as to make the most of any materials which may be at hand, such as bricks or stones, &c.

Whilst this is being done, unoccupied men stand or sit round those at work, listening to the explanations which are being given. Fire-wood is brought by the troops or else procured on the spot by arrangement with landowners. By way of practising Officers and non-commissioned officers in choosing the site for a bivouac, it is the custom to send on in advance of a body of troops on its way out to manœuvre a patrol commanded by an Officer, who is required to fix upon the most convenient spot for the corps to which he belongs, or even for some stated number of troops, which may only exist in imagination, to bivouac in. Care is taken to make all these exercises conduce to the general instruction. Thus the position for a vedette, or for a small post, the site of a cooking-place, &c., is never selected without full explanation being given aloud to all the men not actually employed, who gather round and watch the preparations with attention.

4. During the practice of minor tactics and other exercises advantage is taken of every opportunity to teach the men how to get over any natural obstacles which may be in their way. For instance, if they come to a ditch they have to jump it in marching order, as they are. They are made to get over hedges, to go through thick woods, calling to one another from time to time, so as not to lose their connection, each unit in such cases having its rallying call. Thus as soon as a regiment enters a thick wood and the soldiers lose sight of one another, they begin shouting out words agreed upon beforehand, such as "Wolf," "Bear," &c., so as to enable men of the different battalions, companies, &c., to know where their comrades are. If they come to a stream, the men are not allowed to ford it, thus damaging clothing and boots; but advantage is taken of the opportunity to teach them how to utilize any materials found on the spot in making rough bridges, always supposing that can be done without damage to, and with the consent of, the landowners. Thus planks or poles are thrown across the stream at different points, by means of which the men have to get over one by one, which is done with great spirit and much chaff for awkward fellows who either cannot get across, or who in doing so take an involuntary bath.

Here again we find the same system of instruction as in other branches of

training, that is to say, all kinds of explanations—why the plank has been placed at one point rather than at another, what particular facts should be noted when you examine the banks of a stream, how and where you can best make ramps of approach to it, in case you want to get a carriage over, &c.

5. Minor tactics, the attack and defence of localities, are practised also at first by companies with or without a marked enemy. Captains and other Officers never lose an opportunity of explaining to their men why they prefer conducting the attack in one way rather than in another. I had the good fortune one day to be present at an explanation of the kind. The Captain, standing in front of his company, said that he had received orders to attack such and such a village; that the ground, as they might see, was of such and such a nature, and presented in consequence such and such advantages and disadvantages. "If I led you in such and such a way, so and so will happen; "if, on the contrary, I act in this other way, the result will be something else; "and so it will be best to act thus and thus." After this he explained to his men to what point they should specially direct their attention during the attack, and how success would entirely depend upon this or that circumstance, &c. In short, everywhere and in everything Officers showed the greatest zeal and the liveliest interest in the operation which they had to carry out.

6. During all the exercises of which we have been speaking instruction is constantly given, both to individuals and to entire companies, in the art of taking advantage of ground under all possible circumstances, care being taken to teach the reason why a certain method is adopted at the same time as the method itself.

7. Wherever circumstances permit, a swimming school is established, and all the men have regular swimming lessons which generally follow some other drill. Thus, for instance, when returning from target practice, or from some other drill of not very fatiguing nature, the men are marched past the swimming school, where they take a bath. Most corps have now these bathing establishments, which, besides contributing to develop hardiness and agility, have also an excellent sanitary effect.

8. No instruction is given in working big guns, but each battalion detaches yearly from one to four intelligent lance-corporals to the artillery for the purpose of learning how to drive small arm ammunition wagons. In this manner they insure having a certain number of men in each battalion perfectly acquainted with this duty, thanks to whom the battalion may at times be extricated from situations of some difficulty.

9. Instruction in field works is carried on every year to a greater extent, much consequence being attached to it in the German Army.

In order to have good pioneer instructors in the regiments, one Officer and six non-commissioned officers are detached annually after the spring drills to the pioneer battalion of the *corps d'armée* to which the regiment belongs, where they learn to do all engineering work which may be useful to infantry. Immediately after the grand manœuvres, divisions of pioneers are formed in each regiment ("pionier-züge"), each company detaching eight privates, and each battalion one Officer. These twelve little pioneer divisions being united, form what is called the "regimental detachment of pioneers," to whom the Officer and non-commissioned officers who were detached the previous summer to the pioneer battalion, impart all the information which they then acquired. The regimental pioneer detachment thus comprises, including its instructors, 4 Officers, 6 non-commissioned officers, and 96 privates.

The Officer instructor is required to put the detachment in six or seven weeks through the same course which he has undergone in the pioneer battalion in the same order of progression.

It will be remarked that these exercises take place in what we have called "the preparatory" period when Captains are occupied in preparing instructors

for the expected recruits, and at a time when the severity of guard and fatigue duties stands in the way of other drills.

At the end of this course of forty-eight days, that is to say a little before the arrival of the recruits, the regimental commanding Officer inspects the pioneer detachment which during the period of field service in the ensuing season will be employed in executing any engineering works required, being reinforced at need by the Officers and men who composed the pioneer detachments in former years.

The strength of this detachment may seem too small for a regiment, but we must not forget that as it is renewed annually in the manner above described, the regiment has a permanent force of three such detachments, that is to say, of 288 well-instructed sappers under whose direction the remainder of the men can well do any work required. Besides, as one Officer and six non-commissioned officers are detached annually, it naturally follows that at the end of a certain number of years, nearly all the Lieutenants and many Officers of higher rank have been through the course, and the regiment also contains a pretty considerable number of non-commissioned officers acquainted with field engineering, particularly as the best men all round are always chosen to be detached to the pioneer battalion.

(*To be continued.*)

ON THE USE OF THE GUN IN A FLEET ACTION.

By A. Le Pontois, Lieutenant de Vaisseau.

Translated from the "Revue Maritime et Coloniale," October, 1880, by Lieutenant R. S. Lowry, R.N.

Having been embarked in the "Richelieu" with the fleet, I was stationed successively at the forecastle guns and in the main battery, and was led to consider what should be the *rôle* of artillery in a fleet action, and what would be the best method of firing the guns under the conditions in which they are placed in our ironclads.

Such is the object of this article, based on my personal observations during my year afloat.

General Considerations.—Discussions are daily occurring among those well versed in maritime questions as to the best means of attacking ships. With some the torpedo is the arm *par excellence*, which it would seem should ensure success, with others the ram takes the first place. Few Officers consider the gun as being of great value, and yet there is not one who would wish to see it overlooked.

The gun, ram, and torpedo are three distinct elements of attack, each having its own value, and each of which should be used judiciously according to circumstances, without attempting to assign a preference to one over the other. Nevertheless, the use of the gun in action should be subordinate to the manœuvres of the ship in trying to ram or sink her adversary with a torpedo. The *rôle* of artillery is not the least in importance, the gun being the weapon which delivers its blows with the greatest certainty. If we look back on the different stages which have succeeded one another in the armaments of our ships, we find that the object aimed at has varied with the progress and ideas of the times. The solid shot exclusively fired in former times against wooden ships, were but a slow means of disabling them. Red-

hot shot, used only by shore batteries, were much more formidable, as they caused fires which were difficult to extinguish. M. Paixhaus, an Artillery Officer, having proved conclusively the terrible effects produced by grenades bursting in a ship, and wishing to regulate the too uncertain fire of these projectiles, conceived the idea of firing filled shell. Shell bursting in the wooden sides caused there serious injuries, and great ravages in the interior of the ship. They also caused fires and explosions. Such was the case with the Turkish fleet completely destroyed at Sinope by the shell of the Russian squadron. Later the advent of ships completely armoured caused this object to be given up, and it became more a question of sinking them with solid shot. Guns of small calibre having been replaced by those of greater power, ships entered on a period of successive transformations, and later types carried armour of greater thickness, but which did not protect them in all parts. A belt of varying thickness at the waterline, with an armoured redoubt and turrets, up to a certain point protected the guns from these heavy projectiles.

For some time past, efforts have been made to protect the decks from the terrible effects produced by the plunging fire of heavy shell bursting in and being able to reach the vital parts of the ship. In spite of this, seagoing ironclads with lofty sides and broadside armament, now in commission or ready for commissioning, show many weak points against shells, which, penetrating the decks, entering by hatchways, or even bursting in the unarmoured parts before and abaft the battery, might cause serious injury, perhaps by damaging an important part of the engines, or by causing fire. The following table, taken from plans, gives the armoured and unarmoured portions above the waterline in some of our ironclads, seen from the broadside.

Name.	Total broadside surface above water in square feet.	Armoured broadside surface above water in square feet.	Unarmoured broadside surface above water in square feet.
"Héroine"	5,487	3,613	1,874
"Surveillant"	5,266	3,614	1,652
"Alma"	3,296	1,498	1,798
"Friedland"	6,807	2,900	3,907
"Redoubtable"	9,814	4,065	5,749

This table shows that the unarmoured portions become greater in proportion as the thickness of plating increases, and that, therefore, there are greater chances of the unarmoured part being struck in action.

The naval action of Lissa is the only one between fleets from which we can gain experience. In this action two Italian ironclads were destroyed; the "Ré d'Italia" by the ram of the "Archiduc Ferdinand Max," and the "Palestro," which blew up in consequence of a fire caused by a shell bursting in the wardroom. The "Ancona," also an ironclad, caught fire, but more fortunate than the "Palestro," succeeded in extinguishing it, the commander having well organized his fire brigade. A quarter of an hour from the commencement of the action the Italian fleet, escorting the burning "Palestro," steamed out of action, demoralized by the losses which it had suffered, and yet more so by the explosion of the "Palestro," which soon occurred. It was then a lucky shell which powerfully contributed to the success of the Austrians, a victory prepared for, it is true, by Admiral Tegethoff, who knew

how to organize his squadron in a brief time, and bring it into action in a compact formation. As for the solid shot fired in converging broadsides at the batteries of the Italian ships, they caused them but slight injuries, and in no case disabled them. It is only fair to state that the projectiles were of but small calibre, and could barely penetrate the plating opposed to them.

There have been no fleet actions since that of Lissa. Torpedoes have now come into play, and should be a powerful aid to success. The Russo-Turkish war gives us some facts which it is well to mention. Turkish monitors were sunk at anchor by Russian spar torpedo-boats, handled with much coolness and energy by Russian seamen; on the other hand, shell fire succeeded in destroying the Turkish monitors anchored in the Danube. The action of the "Vesta," which was published in the "Révue Maritime" of October, 1877, shows the great effect of a shell bursting in an ironclad. The "Vesta" was a despatch boat, armed in war time with light guns of 15 cm. and 11 cm. She found herself close to a Turkish ironclad of equal force to one of our armoured corvettes. The "Vesta" not considering herself able to engage so powerful an enemy, took flight, opening fire with her stern chase guns. A shell having struck the Turkish ironclad on the unarmoured forecastle sheltering her chase guns, and another having either caused a fire or struck a boiler, the Turkish ship was obliged to abandon the chase.[1]

All these facts tend to confirm the idea that the time of common shell fire is not passed, and that armour-piercing projectiles should not entirely replace them in actions between ironclads. In all that concerns the evolutions or manœuvres of squadrons in action, nothing positive can be laid down or recommended. Several tactics have been tried in different Navies, but experience has not confirmed the advantage of this or that "order of attack." One principle cannot be doubted, *i.e.*, that the ships should come into action in as close a formation as possible, firing bow guns as they approach, pass through the enemy, and turn and charge him again.[2] It is in following this order of ideas that we must study the action of artillery and the most efficacious mode of using it, always remembering that in certain phases of a naval action the conditions of the struggle and the use of the guns would have to be modified.

The seagoing ironclads with high freeboard and broadside armament of the different Powers, as the English "Hercules" and "Alexandra," the German "Kaiser" and "Deutschland," show, like our own new types of ships, sensible differences in thickness of plating, guns, &c.; but their interior arrangements are the same, and in studying the strong and weak points of one of our ironclads, the "Richelieu" for instance, we shall find some axioms for the system of attack we should adopt, looking at it specially from the gun's point of view. The "Richelieu's" extreme length is 318 feet, her breadth is 57 feet. She is armoured from stem to stern, up to 5 feet above the waterline. The thickest plating is 8·8 inches. In the central part of the ship is the armoured redoubt, divided into two parts: the lower part protecting the passage of projectiles, &c., and the upper part forming the gun-battery, armed with six 27-cm. guns of the 1870 model. The battery is 108 feet long by 47 feet broad. The mainmast and funnel both pass through it. Before the battery is the mess-deck for the crew, and abaft the cabins,

[1] This account of the action of the "Vesta" has since been contradicted, and it has been stated officially by the Turks that no projectiles fired from the "Vesta" struck the Turkish ironclad.

[2] Many Officers in our Service, and especially Captain Noel, disapprove of the bow guns being fired while closing to engage, but if they ceased firing at 2,000 yards, as suggested by the writer, their smoke would hardly impede the view of the commanding Officers at any critical period. The practical utility of firing bow guns at ranges much over 2,000 yards is doubtful.

&c., for the Officers. The sides are formed of thin sheet-iron which completes the shape of the ship. Four armoured barbette towers are placed on deck at each angle of the battery, carrying four 24-cm. guns. One chase gun is placed under a forecastle of thin plating, which shelters it from musketry fire only. Ten 12-cm. guns, four machine guns (Hotchkiss), and two 14-cm. guns, intended, in case of flight, to be worked in the Admiral's cabin, complete the armament of the "Richelieu." The magazines and shell-rooms are placed below the waterline, at the foremost and after ends of the armoured central redoubt, from which the only access to the other parts of the ship is by armoured doors intended to be closed in action, and by two small hatches communicating with the engine-room and the deck.

Supply of Powder and Projectiles.—The question of the supply of powder and projectiles is directly connected with the working of the guns. At the fore-end of the armoured redoubt are two magazines, and on each side one shell-room for 27-cm. guns, and one for 24-cm. guns; at the after part is one magazine and two shell-rooms for 27-cm. guns, and one for 24-cm. guns; these contain all the ammunition for the heavy guns of the "Richelieu." The projectiles are stowed on their sides in the shell-rooms, and have a long distance to travel before reaching the guns. They are first slung, then hoisted by tackles on the orlop deck, next run along a tramway beneath the scuttles, through which they are whipped up into the batteries. All these operations require the use of complicated tackles, the scuttles or hatches in the flats and those in the gun-decks not always corresponding.[1] In the "Richelieu" 182 men, without counting those in charge, are employed in the shell party and magazinemen, and are barely sufficient to ensure keeping up a supply to the guns. It takes ten minutes from the time of sounding to general quarters before the guns on the upper deck can be loaded. Those in the battery are quicker, the projectiles travelling more directly to the guns. The good or bad arrangements for supply depend more or less on the fittings of the ship, so that a regular rule regarding them cannot be established. It should, however, be possible to arrange the fittings in such a way that a projectile coming out of the shell-room should take the tramway at once, and be brought by it directly under the gun it is intended for. Thus work would be reduced and simplified, and such a large number of men would not be required in the magazine and shell-room parties.

Central Battery.—The central battery is armed, as we have said, with six 27-cm. guns, burning a charge of 92 lbs., firing chilled projectiles of 475 lbs., and common shell of 396 lbs. The chilled projectiles will penetrate normally and at the muzzle plates of 13·4 inches, and at an angle of incidence of 30° (the maximum angle of penetration) plates of 10·6 inch. The distance between the guns from axis to axis is 34 feet. Extreme elevation is 6°, extreme depression is 4°·30′, which allows a projectile to strike the water at 210 feet distance.[2] Horizontal training is 70°. The loading is easily performed

[1] The 182 men required in the "Richelieu" is rather in excess of that needed in most of our ironclads. In H.M.S. "Téméraire" 138 were told off for this duty during her first commission, they were found amply sufficient, and the supply might have been kept up with less. Only four 10-inch and four 11-inch guns had to be supplied, so that each gun required as many men to feed as to fight it. Again, the watertight doors in two bulkheads had to be opened to supply shell from the shell-room to the two 11-inch guns in the fore battery, and the doors in one bulkhead to supply powder, or else powder and projectiles for them must go over upper deck. In H.M.S. "Swiftsure" 112 men were needed for ten 9-inch guns, and barely sufficed. The rear numbers at the guns were also required to bring the projectiles from the hatches to the guns. In H.M.S. "Superb," with her long battery, a yet larger number in proportion to armament are required.

[2] In most of our ironclads the extreme elevation with broadside guns is from 10° to 15°, extreme depression from 5° to 8°.

in the usual manner. The training, which is done with tackles, is slow and heavy, and requires a large gun's crew. The crew of the 27-cm. guns in the "Richelieu" is 22 men; in the new "Manuel du Marin Canonier," it is laid down as 24 men. Although the ports of the "Richelieu" are wide enough, and give the guns a theoretically wide horizontal training, the difficulty of training is easily noticed when firing at a target, and would be much more so in action. In fact, to enable Nos. 1 to make a good shot it is not sufficient that a line of sight can be got out of the port. It is only necessary to stand at the length of the tube lanyard to see that the field of view is most limited, and is to a great extent hidden by the size of the breech. In the midst of a squadron action, where the ships are passing broadside to broadside, in the midst of smoke and at close quarters, as will generally be the case, how could the initiative of firing be left to the Nos. 1? How could they regulate the scales in the battery, and know whether the ship passing be friend or foe? Besides this the smoke of one gun fired on deck will be sufficient to hide the object which is so quickly passing the field of fire. It would be the same if one gun in the battery were fired; the five others, hidden in smoke, would be obliged to wait till the object was again visible, and when that time came it might be no longer possible to strike it.

Table 10 in the "Manuel du Matelot Canonier," shows that only 15 seconds is required for two ships passing each other at the rate of 12 knots respectively, broadside to broadside, and at a distance of one cable, to cross a field of fire of 50°. It is then indispensable that the fire of the broadside guns be directed from deck, and by an Officer who, standing close to the Captain, knows his plans, has a clear view of the enemy and the conditions under which he must pass him. It is further necessary that this Officer should have the firing key in his own hand, so as to fire all the guns on that broadside at the same instant. The duty of the 27-cm. guns is seen at once; they are the most powerful and should be laid for the most vital part of the enemy; they would be loaded with chilled projectile, laid on the beam, and slightly converged so that the projectiles may strike nearly normally on the ship passing, the courses of the two ships being at this moment practically parallel. The batteries of ironclads having a length of about 100 feet, and a height of about 16 feet, show a large target which should be easily struck, and the position of which will be shown, even in smoke, by the funnel which occupies the centre.

The method of firing our guns with the Service friction tube is evidently not convenient for broadside firing. The Commission on Artillery for the Fleet, when considering the question of firing the guns instantaneously, understood all its importance. They put forward the idea that a combined percussion and electric tube would solve the proposed problem. Some attempts at transforming Service friction tubes with the means at hand on board ship into electric tubes, have given such good results that the Commission have requested that thorough trials should be made by experts. I am not aware whether this request has been complied with, it certainly should be taken into consideration. It is our part to state what we require, the part of specialists to supply it.

We have said that the crew of the 27-cm. gun is 24 men according to the new Manuel, who are employed mainly for training. Six crews for the 27-cm. guns give a total of 144 men. Add to this the Officers, gunner's mates, &c., and in action there would be about 160 men in a confined space of 108 feet by 47 feet, out of which it is necessary to add that the funnel and mainmast occupy a considerable part.

A lucky shot penetrating the battery would cause the greatest slaughter, and produce the most baneful moral effect on the large number of men unable to communicate freely with the rest of the ship.

There is then a strong reason for reducing the guns' crews as much as

possible during the action, a reserve being available to quickly fill up casualties.

The old classification is retained in our ironclads, dividing the guns' crews into boarders (armed with rifle or cutlass), sail trimmers, and fire parties. Boarding must for the future be considered impossible in naval actions at sea, the boarders naturally forming the guns' crews.

In the "Richelieu" 14 men work the gun, and are sufficient, especially if the principle we have established of firing broadsides laid beforehand is admitted. The 60 men which remain available in the battery would be armed with rifles, they would be placed before and abaft the battery, and should fire through the ports, uniting their action with that of the musketry on deck.[1] They would serve as a reserve for the guns' crews, and should be ready to extinguish any fire in their neighbourhood at its first commencement. Chilled projectiles only being used, the question of supply is simplified, and there is no reason they should not be got up on to the gun-deck beforehand. There would thus be several men who could be told off to look out for fires in the flats forward and aft, at the same time standing by if required for the shell party again.

There is no Service plan for protecting the guns in the battery and their crews from flying splinters or bolts on projectiles striking the armour-plating. It is most important to adopt some safeguard against this danger. Some experiments made by the Commission at Gavre after the war of 1870 have shown the advantage of using rope mantlets, laced by the head and foot ropes to the sides. These mantlets would only partially stop splinters of shell. It is quite time to raise the question afresh, and to determine some better mode of protecting the guns and their crews from splinters.

The English have understood the importance of this question, and have taken steps to separate the guns from each other, so as not to run the risk of having the whole battery disabled by one lucky shot.

Forecastle Guns.—The 24-cm. guns which gave fore and aft fire in the "Richelieu," throw, with a powder charge of 61·6 lbs., chilled projectiles of 316·8 lbs., common shell of 264 lbs., and shrapnel of 220 lbs.

The barbette towers are placed over each corner of the battery; the distance from centre between the two abreast is 39 feet, between the foremost and after ones it is 91 feet. The guns are mounted *en barbette*, the trunnions at 28 feet above the waterline. The gun's crew, consisting of twelve men, work it easily. The topsides fall in before and abaft the barbettes, allowing their fire to cross at about 100 yards ahead and astern of the ship. With extreme depression (5° 30′) the projectiles strike the water at 99 yards distance. Extreme elevation gives a range of 7,200 yards. The 24-cm chase gun under the forecastle is only protected by rifle-proof plates. It fires under the bowsprit, which has great steeve, and it can range up to 8,400 yards. Extreme depression is 7°, and allows the projectile to strike the water at 65 yards from the ship. The necessity of reducing the gun's crew as much as possible has been felt. The mechanical appliances of the carriage and slide allow the gun to be worked by ten men, while the service number for the 24-cm. mounted on frame carriages on the broadside is twenty-two men.

It has been stated that the battery guns could only be fired with effect in action at the moment when the ships are passing broadside to broadside, that they should be fired together at the central part of the enemy, and that the fire should be directed from the upper deck. It appears that the guns on deck have another part to play; being mounted *en barbette* the Nos. 1 can see the enemy plainly; and besides the guns are farther apart and isolated in

[1] A similar plan was proposed in some of our ships, had they engaged the batteries in the Dardanelles, the guns' crews from the disengaged side firing through the scuttles of the ports before and abaft battery.

their towers. They could not then act so well together as those of the battery; each of them should therefore have a well-defined part to play, and should use its elevated position to reach with a plunging fire the unarmoured part of the enemy before and abaft his battery. Common shells are the most advantageous, being able to cause fires, and also to reach the vital parts of the ship. The Nos. 1 for these guns should be chosen as the smartest and most intelligent; they ought to be able to lay the guns quickly and accurately.

We had several general quarter days with firing during my year aboard the "Richelieu." The smartest of the barbette guns of the "Richelieu" gave a mean of 3 mins. 3 secs. per round. Allow 3 mins. per round for the barbette guns, and imagine two squadrons steaming towards each other to engage; the order has been given to the chase guns to open fire; they should cease firing when the ships are 2,000 yards apart so as to be ready to fire a round close alongside, and, when muzzle to muzzle, at the moment the ships are broadside on. Two ships steaming 12 knots towards each other approach at the rate of 803 yards a minute, and they will be hardly 3 minutes covering the 2,000 yards. The barbette guns, laid with extreme depression, should fire the foremost one at the foremast, the after gun at the mizenmast.

If the smoke prevents No. 1 at the after gun from even seeing the masts, he need not hesitate as the second shot should be fired about 6 seconds after the first. The guns would then be rapidly loaded, and should fire again during the time the ships are turning 16 points to repass each other.

Light Guns.—The light guns on the upper deck of the "Richelieu" could not be worked in action; they are placed before and abaft the barbette towers, and would not allow the heavy guns in them to be trained fore and aft. Their duty, however, ought to be important enough, and should not be neglected. Their place should be on the upper deck between the barbette towers, where there is a space of 58 feet; they would thus be sheltered from fore and aft fire, and only exposed to that from abeam. The boats stowed when at sea on the upper deck would not allow guns with much recoil to be used here.

The Hotchkiss revolving gun, the capabilities of which have been shown by the Commission of Gavre, could be easily used instead of the light guns now in ironclads; they are worked by two men, aimed from the shoulder like a rifle, and have no recoil. They throw shell of 19 ozs., which pierce a plate of ·9 inch at the muzzle, and of ·2 inch at 2,000 yards. Six Hotchkiss guns could be placed on each side between the barbettes of the "Richelieu," and would be most useful whether in a fleet action in sweeping the decks and gangways, or at anchor in repelling torpedo-boats.

Summary of Conclusions.—I have endeavoured to make in this paper some remarks on the use of the gun in an action between squadrons. After having emphasized the great effects of a shell bursting inside an ironclad, and having noticed the large spaces against which common shell fire would be most effective, I have carefully studied the particular conditions for the guns in our recent ironclads. I do not wish to invent, but have merely proposed principles the application of which would be easy. I have said that the "Richelieu" requires 400 men to work and supply six 27-cm. guns and five guns of 24-cm. We know that the heavy English guns of 80 and 100 tons can be worked by few men, consequently I ask—

1st. That tackles be replaced by mechanical appliances for training;

2nd. That the leads for supply be more considered, so that the projectiles should arrive more directly at the guns.

We have shown besides the disadvantage of having a large number of men in the battery during action, and also of leaving the decks before and abaft it deserted, as fires may be caused there by shell. We ask that the crews for the guns in the battery should consist of just enough men to work the guns well, and also a reserve to fill up casualties, or to strengthen the numbers on the gun deck at any given moment. This reserve should be stationed before and

abaft the battery, firing through the ports so as to assist the small-arm men on deck, and also to at once extinguish fires occurring in their neighbourhood. The questions of electric firing, and protecting the interior against splinters, should be studied and applied practically.

Hotchkiss guns taking the place of light guns now useless on the upper decks of our ironclads, would greatly increase their powers of offence. Of course, the rules we have proposed for the fire of the guns are not absolute. Varied and unforeseen circumstances will present themselves during a naval action, and in them it will be necessary to act on the spur of the moment. We think, nevertheless, that we have not erred much in the commencement of our action under the assumed conditions, and that the beginning of the engagement ought to have the greatest influence on the final result of the struggle. We propose these principles for whatever they may be worth : –

1. That the battery guns should fire broadsides by director using chilled projectiles, the Officer at the director being close to the Captain. The broadside should be fired at the centre of the enemy when he is right abeam.

2. That the upper deck guns should fire common shell. That the barbette guns should always have a round ready for the ships passing, which they would fire with extreme depression into the unarmoured portions before and abaft the central battery at the instant when the ships are alongside.

General Note on Conclusions drawn by Author.

1. Most Officers agree with the author that for at any rate the opening of an action "electric firing by director" should be used. This opinion prevailing in both our own and foreign Services, a tremendous fire from both machine guns and small arms would be brought to bear upon the director. The chances of its being disabled (no matter how well protected) at the very last moment before the broadside will bear, should then be pre-arranged for. At present the only means is "electric firing-gun directing." Were this order given, and Nos. 1 to act according to rule, guns' crews would spring up, and Nos. 1 would train for the object, which has probably not yet come into the field of view ; the crews would then come into the elevating position and wait for the elevation from the directing gun. Thus confusion would be caused at a critical moment, the broadside *not* be converged, and the guns' crews all standing up and exposed.

Suggested.—That when firing by director, No. 1 of the centre gun, or better, the Officer of the quarters, should have a second firing key in his hand : then if the word be passed down, "director disabled," he could fire the broadside exactly as before, no confusion or delay occurring. Such a system could be easily introduced in sea-going ships without any alterations to present fittings or drill.

2. In view of the terribly destructive effect of one successful broadside, and even if it fails, the great advantage of obscuring yourself in smoke—if at close quarters your enemy as well—I would suggest that the broadside be fired some 15° *before* the beam, unless the plating opposed to you is much more than a match for your guns.

3. The action between the "Shah" and "Huascar" proved how ineffective common shell are in most cases for incendiary purposes. It is then most important to obtain some form of incendiary shell for the Navy, to enable us to utilize the many light and torpedo guns now placed on the upper decks of our ships, by causing fires in the large unarmoured portions of modern ironclads. Some experiments made in June, 1880, at Shoeburyness, with 64-pounder common shell, filled with incendiary stars, and fired at two rows of wood targets placed behind an oak butt, gave the following results :—Out of nine shells which struck the butt, seven caused fires more or less serious, but the stars used do not appear to have been very effective, as in many cases they stuck in the wood and burnt out without setting it alight. Could such a projectile be perfected, it would be invaluable, both for ship actions and for bombarding savage villages.

NOTICE OF BOOK.

Taktik. Verfasst von Max Thyr. Wien, 1880. Seidel and Sohn. Three volumes, pp. 815. Weight under $3\frac{3}{4}$ lbs. Size $10'' \times 6\frac{1}{2}'' \times 2\frac{1}{4}''$. Price, 24*s.*

In view of the constant changes which are taking place in the armament of infantry and artillery, and the corresponding alterations in Tactics necessitated thereby, few men will be found willing to spend their time and labour on a work of such ephemeral value as a Treatise on Tactics. It is, therefore, to the lecturers on this branch of military art in the principal War Academies of Europe, that we must look for information respecting its position at the present moment. Lieutenant-Colonel Max Thyr, Professor of Tactics at the Imperial War School at Vienna, has recently given to the public the substance of his Tactical Lectures, in a work which appears to be of considerable value. The first volume deals with the subject from the Leader's point of view, on general principles; philosophical and historical aspects are included. In the second volume are treated the details of the Tactics of each arm, and those of the principal European Armies are also explained. Tactics other than those of the combat, as, for instance, cantonments, marches, outposts, &c., form the subject-matter of the third volume. —L. A. H.